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THESIS

DOD CONTRACTOR PROFITABILITY 1980-1984

by

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December 1985

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ABSTRACT

The overall purpose of this study is to present appropriate comparative data on major DOD contractors and to evaluate their profitability during the period 1980-1984. The study is structured to examine two principal research questions as they apply to a sample of 49 prime DOD contractors. The first examines profitability from the macro level, i.e. the defense industry taken as a whole. The second involves an analysis of several defense contractors at the micro level, i.e. individual firms and specific business segments. The study includes a discussion of the defense perspective of the 1980's, an historical summary of DOD defense policy, a review of profit studies, and a summary of selected financial data. The study's main conclusions are that on the basis of the profitability measures selected and for the period 1980-1984, DOD prime contractors were (1) more profitable than their like-sized commercial oriented competitors and (2) on both an aggregate and segment basis, less exposed to risk.

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I. INTRODUCTION

Since the early part of the nineteen sixties there have been many discussions and numerous studies completed on the profits attained by major government contractors. The press is alive with many new discoveries of seemingly overpriced items purchased "blindly" by the Defense Department. The view of many is that the prime defense contractors are taking undue advantage of their positions, leaving the Department of Defense and the taxpayers to carry the burden of the corporations' profitability.

The issue of profitability of those corporations that supply the government with the goods and services to support the national defense is a crucial and controversial one. With due regard to the risk factor, if the profits gained on government business are higher than those gained in the private sector, the government is wasting resources. Conversely, if the profits are significantly lower in the government contracting business, then the major contractors will seek other markets, and the quality and availability of the necessary defense supplies will be adversely affected.

Despite the many profitability studies that have been done, there seems to be little agreement on whether or not the major defense contractors are reaping greater, equal, or lesser returns on business than the corporations engaged solely in the private marketplace. In light of this uncertainty, a further step into the profitability dimension was taken that will clarify some of the confusion in this area. The overall purpose of this study is to present appropriate comparative data on DOD contractors and to evaluate their profitability. Two important disclaimers are in order. First the research objectives and comparisons are focused on presentation of objective, quantitative finanacial data. There is no attempt to determine, on a qualitative basis, the reasonableness or adequacy of profits. Second, this study has relied on published accounting data througnout, particularly as they reflect the allocation of costs, and no attempt is made to analyze the quality of reported earnings. While data sources and their limitations are addressed in detail in Chapter II, the study hinges on the presumption that reported costs are properly allocated and accurately classified. Allocation distortions with respect to DOD contracting will tend to increase DOD contract costs and reduce profits. In general, comparisons will be less pronounced. A full discussion of the quality of earnings is thus beyond the scope of this thesis.

The study was structured to examine two principal research questions. The first examines profitability from the macro level, i.e., the defense industry taken as a whole. The second question takes a closer look at several defense contractors at the micro level, i.e., individual firms and specific business segments within those firms. Both questions are addressed in the same time frame to facilitate comparisons and to serve as reference points for possible replication or further study. Whether this period of study, from 1980 through 1984, is representative of future trends, valuable in illuminating previous ones or merely an anomaly is only speculation and the proper focus of future research.

1. What is the relative profitability of firms doing business with the government?

In the first question, a traditional approach is taken in comparing profitability by identifying the companies that rely heavily on DOD contracts and comparing their returns to some base level. Directly related to and a subset of the question of profitability is the question of the risks involved in depending on government contracts for a significant portion of profits.

2. How do profits of the defense-oriented segments (90 percent or greater of sales to DOD) within 13 prime Department of Defense contractors compare to the corporate segments principally involved in private markets?

The second question requires disentangling business segments so that those segments principally engaged in supplying DOD may be compared with the other segments of the corporation which rely more extensively on the private sector. In addition to considering the intracompany comparisons, government/DOD segments are pooled and compared with the private sector segments on an intercompany basis.

Each of the research questions is addressed separately, Question 1 in Chapter IV and Question 2 in Chapter V.

A. DEFENSE PERSPECTIVE OF THE 1980's

The 1980's provide an interesting, albeit unusual, time frame to study defense contractors. The growth of national defense spending under a pro-defense President might suggest a favorable business environment for defense contractors. However, the increases in defense spending must be quantified and put in perspective, i.e. in terms of Gross National Product (GNP), the national budget, and changes in total DOD contract awards [Ref. 1: Secs. 5 and 6]. Table 1 provides these summary data.

As a percent of GNP, national defense budget authority has seen minor fluctuations but has averaged 5.84 percent during the period 1980-1984. By comparison, during the previous 5 year period, the average was 5.16 percent.

In 1980, national defense's share of total budget authority[1] was 21.2 percent. In 1984, it had grown to 28 percent and is projected to increase to nearly 33 percent by 1988. Outlays[2] (in current dollars) for National defense have increased 70 percent over the 1980-1984 period, compared to a 49 percent increase in the 1976-1980 period.

From the defense contractors' point of view, the principal interest is how much of the increase in defense spending is allocated to prime contracts for goods and services. A review of DOD prime contract awards during the period reveals that allocation of the national defense budget authority to prime contracts has remained nearly constant (50-54 percent). As a percentage of outlays, prime contracts have ranged from 57-63 percent.

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[1] Budget authority is appropriated each year by Congress and represents funding that will be spent over a subsequent year or period of years.

[2] Budget outlays are the dollars that are actually spent by an agency during the fiscal year.

TABLE 1
DEFENSE SPENDING IN PERSPECTIVE: 1980-1984
(billions of current dollars)

	FY-80	FY-81	FY-82	FY-83	FY-84
GNP	2575.8	2885.9	3046.0	3221.4	3581.1
TOTAL BUDGET AUTHORITY	678.1	749.1	813.8	887.9	949.7
DEFENSE BUDGET AUTHORITY	143.8	180.0	216.5	245.0	265.1
DEFENSE OUTLAYS	133.9	157.5	185.3	209.9	227.4
PRIME DOD CONTRACTS	76.8	97.4	116.7	128.2	133.6

Source: Office of Management and Budget, Historical Tables: Budget of the United States Government Fiscal Year 1986. GPO, Washington, DC 1985.

In terms of GNP, share of national budget, and dollar value of prime contracts let by the DOD, the size of the DOD "pie" has increased dramatically in the 1980's. A clear upward trend has been established, and it is against this backdrop that this study must be viewed.

B. THE DOD PIE

In studying the profitability of corporations, the question of the present and projected future demand for the products plays a significant part in the overall evaluation. With the Department of Defense prime contractors, a wary eye has been cast toward the longevity of the customer and supplier relationship. This can be seen in the financial reports of DOD-oriented firms where a caution is included concerning the possible termination of the long term contracts at the convenience of the government. These statements are usually followed by affirmations about the protection provisions covering costs incurred as well as the payment of any applicable fees or profits. Even with the threat of possible termination[3], there are many companies vying for a piece of the defense market "pie."

Within the short time frame of this study, which admittedly covers the defense buildup of the eighties, the obligation of prime contract dollars has risen from $76.0 billion in fiscal year 1980 to $133.6 billion in fiscal year 1984 [Ref. 3], an increase of 57 percent. Figure 1 shows the increase of defense contracts in relation to the increase of the national budget authority.

---

[3] From reports published by the U. S. Department of Defense, Directorate for Information, Operations and Reports (DIOR), terminations for the past five years have averaged .5 percent of the total value of contracts awarded [Ref 2].

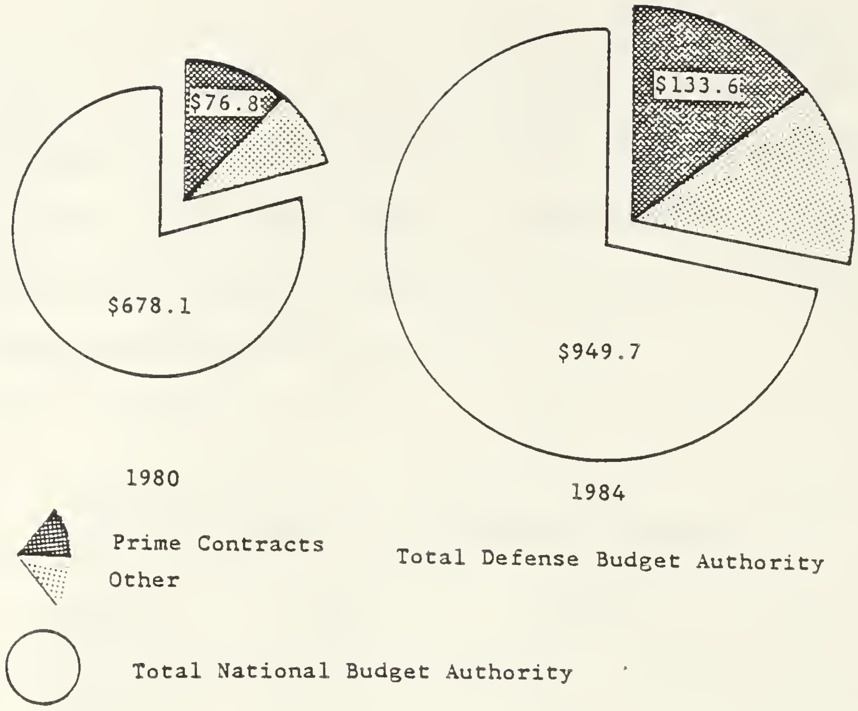

Figure 1. Defense Contracts and the National Budget

The source used for information concerning the annual size and the recipients of the major portion of the Department of Defense contracts is the DOD Directorate for Information, Operations, and Reports (DIOR) publication entitled 100 Companies Receiving the Largest Dollar of Prime Contract Awards (Top 100) which is further described in Chapter II. The following are pertinent facts concerning the Top 100 summary data as they apply to this study. Selection of companies for study is explained in Chapter III.

(1) Prior to 1983, the companies listed were for prime contracts awarded in excess of $10,000. Since 1983 the listing is for contracts which exceed $25,000.

(2) The 100 companies listed each year have received between 65 percent and 70 percent of the total volume of awarded contracts.

(3) In the five years studied, fifty four companies consistently appeared each year.

(4) The forty nine companies that were selected for study from the fifty four received between 49 percent and 54 percent of the total contract awards.

(5) Over the period covered in this study, an average of 17 companies per year were added and subtracted from the list of 100.

In summary, the "pie's" largest pieces are obligated in single and multi-year contracts and are repeatedly won by a select few. The remaining portions are sought and won by companies which are not included in the "Top 100" on a consistent basis.

C. PROBLEMS IN STUDYING PROFIT

1. Definitions

Because the term "profit" may be used and interpreted differently by economists, accountants, corporate financial officers, lenders, government contracting officers, and federal agencies, its definition is of primary importance. In this study, profit is defined as the amount of gross revenues that remain after deduction of all costs, expenses, interest, and taxes. Therefore, "profit", "net profit", and "net income" are considered synonymous. "Operating profit" is defined as earnings before interest and taxes.

Profit is generally related to some other financial measure (i.e. sales, shareholder's equity, total capitalization etc.) and expressed as a percentage . This percentage, with profit as the numerator and another financial measure as the denominator, provides the profit "rate" or "return" on a specific base. The denominator or "base" is critical in measuring profitability, for totally different conclusions can be reached using the same numerator over different denominators.

In this study, "net worth" and "sales" are used for the bases in the profit equations (specific reasons for using net worth follow in this section and for using sales in Chapter V). The definition of net worth is important, for there are many financial information sources that differ in the treatment of its components. For this study, "net worth" includes all capital stock (less preferred stock that carries mandatory redemption restrictions or is outside the company's control), surplus, and retained earnings.

2. Selection of a Profit Measure

A number of profit measures have been used in studying defense contractors. While no one measure has gained universal acceptance, net income divided by net worth was selected as the comparative measure because of the following reasons:

A. it precludes the distortion introduced when trying to account for government-furnished plant, property, and equipment.

B. over time, significant changes to a corporation's financial structure will ultimately be reflected in its net worth.

C. to enable comparisons with the principal profit studies completed in the past that have used this particular measure as a profitability baseline.

D. because net worth is an important statement of the long term financial health of a company to its stockholders and potential investors.

3. DOD-specific Problems

There exist several peculiarities in studying DOD and its contractors which have a measurable effect on annual data. To reduce these annual variations within specific firms, most of the data in this study has been "aggregated" or grouped together. Individual firms' financial data have been added to those of other firms and a mean or average obtained. This is useful in comparing corporate behavior because the mean or average represents a group of firms viewed as a single entity. Throughout the study, aggregated data will be identified by the use of means and/or the actual number of data elements included in a group. Unless otherwise noted, all data refer to the specific period of this study, 1980-1984.

a. Timing.

A fundamental problem in studying contractors is the time dimension. DOD reports conform to the federal fiscal year (e.g., October 1- September 30). This can create a timing difference for a corporation that is awarded a major contract in the first quarter of a fiscal year, files calendar year-end reports to the SEC and ends its corporate year on 30 June the following year. The resulting distortion in data is apparent on an annual basis. For example, in 1982, DOD reported contract awards to a firm that exceeded the firm's total sales as reported at year end. This can be traced to two factors. First, the FY83 DOD contract awards represented multi-year procurement and second, the firm's financial reports recognized only the initial year's revenues. However, by using aggregate data, such isolated annual distortions have been minimized.

b. Non-DOD Government Contracts.

Annually, DOD discloses both the dollar value and the specific firms awarded prime contracts [Ref. 3]. However, many of the contractors listed are awarded additional government contracts that are not included in the DOD figures. This is apparent when specific business segments are examined in Chapter V. All of the firms studied are segmented by product, business line, or major customers and report revenues and expenses on that basis. Generally, DOD and non-DOD government contracts are lumped together in financial reports and labelled "government work". However, because the proportion of non-DOD government work is relatively insignificant, DOD work remains valid as a proxy for total government work[4].

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[4] For example, one of the primary non-DOD government agencies that awards contracts to a number of the firms studied is the National Aeronautics and Space Administration (NASA). In terms of budget, NASA's total budget authority has amounted to approximately 3 percent of DOD's total each year.

c. Miscellany.

Many defense contractors actively participate in the Foreign Military Sales (FMS) program. FMS sales were included as government sales because DOD administers this program of Allied procurement.

4. Summary

In summary, the study of profit in the public or private sectors is inherently difficult because of definitions, selection of an appropriate base, and the variations in data reported by the financial information services. DOD contractors' profitability is further complicated by timing, treatment of non-DOD government contracts, and the FMS program.

D. HISTORICAL SURVEY OF PROFIT STUDIES

The number of profit studies of DOD contractors completed during the last 20 years is considerable (the Profit '76 annotated bibliography includes 53 citations alone), although the majority were completed between 1966 - 1977. Many of the studies concentrated on the 1960's and were clearly skewed by the demands of military operations in Vietnam. Most recently, DOD has concluded an 18 month study of defense contractors that was released in August 1985 [Ref. 4], the first such comprehensive study since Profit '76 [Ref. 5].

Profit has not been a major topical subject for the last 10 years. There are isolated studies, a modest number of journal articles, and less than a dozen known theses on the subject. By far the most voluminous reporting on profits of DOD contractors has been in the news media. Of all these various sources, the most useful to this research effort have been the formal studies undertaken by the RAND Corporation, the Logistics Management Institute (LMI), Government Accounting Office (GAO), and the Department of Defense (DOD). Because of the detailed methodologies, breadth of data, and bibliographies, the studies in this group are considered "baseline" works. A second group of studies primarily represent critical analyses of the baseline studies, often "borrowing" the data and methodology of the primary researchers.

While the methodology of the baseline studies is of continuing interest to future researchers, the major conclusions of the studies are important for two reasons. First they provide the historical context in which to view changes in DOD profit policy. Second, the conclusions lack any general consensus. They either "prove" that DOD contractors operate in an environment of low risks and high profits or high risks and low profits. There's little in the way of middle ground. While this polarization is exaggerated, there is no single study whose conclusions are universially accepted. The studies vary significantly in level of objectivity, size of data base, and most important, the profit measure itself. More often than not,the conclusions become a product of the specific profit measures established at the outset of the study. Among the measures included in these studies were profits as a percentage of sales, as a percentage of shareholder's equity, and as a percentage of total capital invested. Various assessments of risk, debt leverage, and capital turnover also distinguish the studies.

The following key events and studies are helpful in understanding the evolution of DOD profit policy and the relationship of a monopsonist DOD to its industrial base. This survey is not all-inclusive but merely representative of the main policy currents:

DATE	EVENT/STUDY
1934	The Vinson-Trammell Act was passed to limit profits on the construction of naval ships and aircraft. It required each contractor to return all profits that exceeded 10 percent of the total contract price for ship contracts and 12 percent of the total contract price for aircraft contracts. Passed in the wake of post-war profit scandals, this statute represented the first attempt to "legislate" profits.
1951	The Renegotiation Board is established to review War, Navy, and Maritime Commission contractor profits and empowered to reduce profits where they are "excessive". All contracts of $100,000. or more contained a

	"renegotiation clause" that could be invoked by the Department secretary.
1962	McClellan Hearings investigate widespread allegations of "profit pyramiding" of defense contractors and their sub-contractors.
1964	"Weighted Guidelines" were introduced for government contracting in answer to Congressional charges of "profit pyramiding" and to prop up a sagging defense industry. The weighted guidelines were a cost-based formula that determined profit by a weighting scheme of 65 percent allocated to cost, 30 percent allocated to risk, and 5 percent allocated to other. The weighted guidelines set a precedent for cost-based profits.
1967	A RAND study, Risk and the Aerospace Rate of Return [Ref. 6] , addressed the question of whether above average return on equity for Aerospace contractors was linked to above average risk exposure during the period 1957-1964. The study concluded that defense contractors' return could not be explained on the basis of risk alone.
1967	Prof. Murray Weidenbaum publishes Arms and the American Economy: A Domestic Convergence Hypothesis [Ref. 7]. The study concluded that

defense work profits (defined as a percentage of net worth) exceeded profits on similar commercial work.

1969 Logistics Management Institute (LMI) Defense Industry Profit Review was published in a series in 1967,1969 and 1970 [Ref. 8].

1967: reported "downward" trend in defense business profitability with concurrent upward trend in commercial profitability. Major indices included profit as a percent of: sales, equity investment, total investment and costs.

1969: continuation of 1967 study. Using profitability base of Total Capital Investment (TCI), concludes that defense profitability as percent of TCI is trending downward while the commercial sector is trending upward, and explained by, more competition, inflation, and fixed price contracts.

1970: based on 1958-1968 data and supported 1967 and 1969 findings. The study found that (1) defense business showed low average profits when compared to commercial business, (2)

	profit inequities exist due to differing capital requirements, and (3) defense contractors are capable of competing in commercial markets.
1971	GAO *Defense Industry Profit Study*, [Ref. 9], concluded that defense business profits were significantly lower than commercial business profits, using profits as a percentage of sales as the measure, in a survey of 74 major DOD contractors and a review of 146 DOD, NASA, and Coast Guard negotiated contracts from 1964-1969. When profits were expressed as a percentage of equity capital and total capital investment, DOD contractors and commercial contractors were similar.
1971	Aerospace Industries of America *Aerospace Profits vs. Risks* , [Ref. 10] addresses adequacy of profits in relation to risk. Profit is expressed as a percentage of: sales, equity capital, and total capital investment. It concluded on the basis of period studied (1966-1969) that profit rates by any measure have fallen and are currently below rates for like commercial work, despite increased risk.
1976	Department of Defense (DoD) *Profit '76* study revealed that defense business was

characterized by high risks and low profits. It led to DPC 76-3, the new profit policy for DOD in 1976, that revised the Weighted Guidelines to increase facilities investment and to increase potential profit by inclusion of imputed cost of capital.

1985 DOD Defense Financial and Investment Review continues the "Profit '76" methodology using 1975-1983 data. It found that during the period 1970-1979 defense profits were comparable to durable goods manufacturers. However, average defense profits during 1980-1983 decreased slightly while profits of durable goods manufacturers deteriorated dramatically. The study concluded that defense business remained profitable because of (1) increased defense outlays and (2) decline in inflation. The study found that the current profit policy was basically sound and in need of only minor refinements.

What has emerged from these primary studies is a wide range of conclusions and little agreement on analytical techniques or research approach. Authorship has predictably led to charges of bias and critical reaction by interest groups. Thus, an historical survey of profit studies is useful in studying profit today only in terms of sampling/selection techniques, statistical methods, and selection of profit indices. In addition, studying the analyses of the major studies is helpful in avoiding the known pitfalls in this research field.

Profit '76, [Ref. 5: pp C3-C4] included a list of salient profit study points that are particularly useful in designing and formulating any study of defense contractors. Those guidelines have been modified to apply specifically to this study and are shown below:

1. Objectivity of the premises and methodologies
    a. What were the underlying assumptions?
    b. Were the assumptions justified?
    c. Was a study approach taken that would eliminate/minimize bias?

2. Representation of the Defense Industry in samples
    a. How were the firms selected?
    b. Are the firms representative of the defense population?

3. Are statistical methods properly applied?
    a. Is data aggregation misleading?
    b. Is the study period long enough to determine accurate trends?
    c. Are data qualified by statistical results, i.e. standard deviation, means, confidence intervals?

4. Do commercial versus defense profits provide a valid basis for comparison?
    a. Are meaningful segment comparisons drawn?
    b. Were profits of all segments used in comparisons?

II. THE DATA

Ideal source data are clear, concise, accurate, standardized, readily available, and consistent. However such data are difficult to obtain, considering the many different accounting practices, reporting principles, and the various forms of DOD contracts. The purpose of this chapter is to identify and explain the selection of the data sources.

In selecting sources for comparison of corporate financial standing, the choices are fairly limited but of excellent quality. All are publicly available and fall into two basic categories: the primary sources (SEC form 10K reports and the Department of Defense Directorate for Information, Operations and Reports 100 Companies) and the secondary sources (Moody's Handbook of Common Stocks, The Value Line, and Fortune).

The primary sources were used for determining the prime contractors, (100 Companies) and for separating and examining the corporations' business segments (SEC 10K reports). The secondary sources were used to obtain standard financial information such as sales revenues, net income, operating margins, and net worth. In the process of accumulating the corporate financial information for analysis and comparison, a significant data base, included in the Appendices, was developed. This data base, when used with the computer statistical program, MINITAB, provided the means for analyzing and testing the data acquired from the primary and secondary sources. Though initially labor intensive, the creation of a data base was well worth the effort, especially for repetitive hypothesis testing and regression analysis. In the remaining portion of this chapter, the use, impact and limitations of each of the data sources will be reviewed.

A. SECURITIES AND EXCHANGE COMMISSION (SEC) 10K REPORTS

The 10K reports were used for segregating, within a company, government business from private industry business and were primarily composed of the corporations' annual report and additional information required by the Securities and Exchange Commission. With only general financial reporting guidelines provided by the Financial Accounting Standards Board (FASB), the contractors follow many different accounting practices and report the data differently. This inconsistency in reporting materially affects the accuracy of the data and hampers direct comparisons.

These differences came to light in attempting to extract the business segment information for the development of a statistical data base. Where some of the corporations clearly present the extent of the government business by segments, others only provide percent of government business for the corporation as a whole.

In the original formulation of the goals of this study, it was hoped that the segments could be separated showing sales, expenses and profits all allotted to particular customers, either government or commercial. Such clear separation was the exception rather than the rule. So the original objective was modified by identifying the segments with 90 percent or greater of sales attributed to the government. This change accommodated the limitations imposed by the differences in financial reporting.

B. FORTUNE

Fortune [Ref. 11] was selected because of the annual evaluation of the 500 largest corporations in the United States. Ranked by total sales, the corporations are also ranked by other financial indicators such as growth rate or total return to investors. For the purposes of this study, the Fortune 500 was selected as a comparative base on which to evaluate the performance of the prime Department of Defense contractors. The comparative measure used in this evaluation is the net income as a percent of stockholders' equity.

C. MOODY'S HANDBOOK OF COMMON STOCKS AND THE VALUE LINE

Both Moody's Handbook of Common Stocks [Ref. 12] and The Value Line [Ref. 13] provide extensive financial and business information in a concise and standardized format. Although differing in numbers of corporations covered (Moody's reports on about 900 and The Value Line reports on about 1700), actual formats, and some of the methods in formulating ratios, they are both considered accurate and systematically current. Both provide quarterly updates on the data and evaluations on all of the companies reported on, with the data compiled from individual corporate inputs.

Moody's Handbook of Common Stocks was selected as a source for comparative corporate data because of the similarity of computing net worth and the operating profit margin with the methods used by Fortune in evaluating the 500. The difference is that Moody's and Fortune exclude the preferred stock when its redemption is mandatory or outside the control of the company in their return on stockholders' equity ratio. The Value Line does not.

D. 100 COMPANIES RECEIVING THE LARGEST DOLLAR VOLUME OF PRIME CONTRACT AWARDS

This report is published annually by the Department of Defense Directorate for Information, Operation and Reports (DIOR) and lists the prime contractors and dollar value of contracts awarded. The report, known as the "Top 100", contains a number of tables which range from displaying the first five companies' percent of the total awards to showing the companies with contract awards in excess of $2 billion. Since only DOD contract information on a government fiscal year basis is included, the usefulness of the report was limited to identifying the corporations and determining the size and distribution of annual contract awards.

III. THE SAMPLES/ DEFINING THE BUSINESS POPULATION

A. SELECTION OF SAMPLES

The initial approach to selecting a statistically meaningful yet manageable sample was to determine the proportion of total corporate sales represented by DOD sales for the firms listed in the DOD "Top 100" report for fiscal years 1980-1984. Sales to DOD were divided by total sales for each firm for each of the five years, then averaged. Using the average proportion of DOD sales for the five year period, each firm was plotted, with the expectation of studying a representative sample in the 40-60 percent range. The results were unexpected: only 4 firms fell into the 40-60 percent range. Expanding the range to 30-70 percent added only 5 additional firms. The greatest concentration was discovered in the 1-20 percent range, and only 2 firms averaged greater than 70 percent for the period. With this added insight, the initial approach was scrapped.

The second approach used to determine the sample proved successful. The 1980 - 1984 "Top 100" reports were surveyed to identify which companies had appeared in all five years. Neither the relative position of the company in the report nor the proportion of the dollar amount of DOD sales to total sales were regarded as factors for selection. An additional requirement was that the companies selected be publicly traded in order to ensure availability of financial data.

This alternative approach yielded 54 publicly traded companies that had survived the period with their corporate and financial identities intact. All of the firms selected could be tracked from year to year despite mergers and acquisitions. Five of the firms whose financial structure was altered by changes that would question the validity of year-to-year comparisons were eliminated after additional research. The best example of this case was AT&T that appeared in all 5 years but whose financial structure after divestiture in 1983 would significantly bias the data.

The 49 companies (Table 2) represent a broad cross section of corporations and include many of the principal industry groupings. On an annual basis, the average proportion of combined total sales of the 49 firms represented by their combined DOD sales ranges from a high of 25 percent to a low of 18 percent. Combining all five years of data yields a 22 percent average. Total sales range from a high of $114,989 million (Exxon) to a low of $281 million (Sanders Associates. Inc.) The single characteristic that links these firms is that they have been among the "Top 100" prime DOD contractors for five consecutive years.

B. ORIENTATION

There was a clear division among the 49 companies in terms of proportion of DOD sales to total corporate sales. The initial approach to sample selection was used to subdivide the 49 firms into two additional comparative

TABLE 2
SAMPLE OF 49 DOD PRIME CONTRACTORS

Allied Corporation
AVCO Corporation
Chevron Corporation
Control Data Corporation
Emerson Electric Co.
FMC Corporation
Ford Motor Company
General Electric Company
Goodyear Tire & Rubber Co.
Grumman Corporation
Hercules, Inc.
ITT Corporation
Litton Industries, Inc.
Martin Marietta Corporation
Mobil Corporation
Motorola, Inc.
Penn Central Corporation
Raytheon Company
Rockwell International Corp.
Sanders Associates, Inc.
Singer Company
TRW Inc.
Tenneco, Inc
Todd Shipyards Corp.
Westinghouse Electric Corp.

Atlantic Richfield Co.
Boeing Company
Coastal Corporation
E-Systems, Inc.
EXXON Corporation
Fairchild Industries, Inc.
General Dynamics Corporation
General Motors Corporation
Gould, Inc.
Harris Corporation
Honeywell, Inc.
International Business Machines
Lockheed Corporation
McDonnell Douglas Corporation
Morton Thiokol, Inc.
Northrop Corporation
RCA Corporation
Reynolds (R.J.) Industries, Inc.
Royal Dutch Petroleum Company
The Signal Companies, Inc.
Sperry Corporation
Teledyne, Inc.
Textron, Inc.
United Technologies Corporation

samples: 36 commercially-oriented firms and 13 DOD-oriented firms. "Orientation" was defined on the basis of DOD sales to total sales. The resulting distribution of the 49 companies on this proportion led to the "30 percent rule". Various studies have used a similar approach with the segregation of firms based on sales orientation ranging from 10-50 percent[1]. In this case, 30 percent was chosen because there was a clear break at that level. Figure 2 shows the interval based on the mean proportion of DOD sales for both groups and its standard

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[1] For example [Refs. 7, 14, 15, 16 and 17].

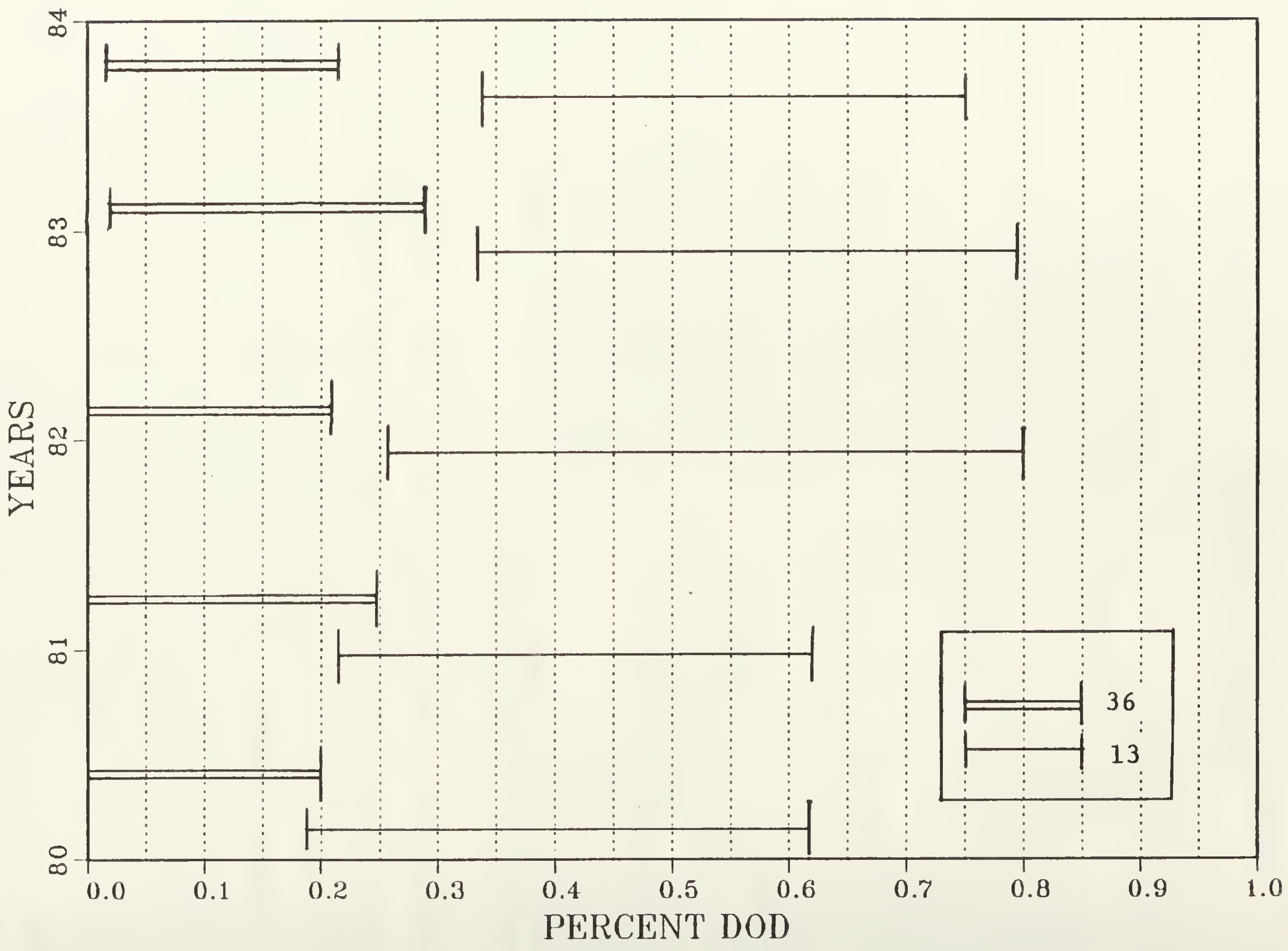

Figure 2. Commercial vs. DOD Orientation

deviation. It was the widest point of separation in the sample and preserved a fairly homogeneous grouping based on a single characteristic.

Selection of another decision rule may have "balanced" the sample (the median of the 49 was 14.3 percent) but would have introduced an unnecessary analytical complication as the sample median lies far below the sample mean. Selection on the basis of DOD sales alone (instead of total government sales) also added a measure of consistency to the comparative base.

1. The 36 (TABLE 3)

The largest sample within the 49 are the 36 corporations considered commercially oriented by virtue of having less than 30 percent of their total business with DOD; the actual proportion was far less. For the five years, the aggregate average was 12 percent with the highest annual average of 14 percent and the lowest annual average of 11 percent.

2. The 13 (TABLE 4)

The second and smaller sample within the 49 consists of DOD-oriented firms whose proportion of DOD business constitutes greater than 30 percent of their total business. Taking the 13 in aggregate, the average proportion of government work within the sample for five years was 49.4 percent with the highest annual average of 56 percent and the lowest average of 40 percent.

3. The Fortune "250"

In order to address overall profitability of the 49 firms to their like-sized competitors, a comparative standard was created, the Fortune "250". Since the Fortune 500 numerical ranking relies on sales volume without regard to industry, customer, or financial structure, it was viewed as an unbiased and appropriate standard. The Fortune 500 provides a traditional base for comparison and the position of the 49 companies in the Fortune 500 was used to determine the proper base. The rank of the 49 companies for each of the five years was recorded and examined for the appropriate cutoff point. The Fortune "250" was the result. Taken on an annual basis, nearly 90 percent were ranked among the upper half of the Fortune 500. Selected profitability data from these 250 firms were used as a comparative base for the samples.

C. SUMMARY

In summary, the method of selection is not inherently biased and has yielded 3 useful samples. The 49 will be used to compare overall profitability of major defense contractors with similarly-sized firms and the 36 and 13 will be used to compare profitability on the basis of DoD business volume. Though the "30 percent rule" may appear arbitrary, it was based wholly on the data distribution and thus might prove less useful when studying other periods with different data sets.

TABLE 3
SAMPLE OF 36 COMMERCIALLY ORIENTED DOD PRIME CONTRACTORS

Allied Corporation
Atlantic Richfield Co.
AVCO Corporation
Chevron Corporation
Coastal Corporation
Control Data Corporation
E-Systems, Inc.
Emerson Electric Co.
EXXON Corporation
Fairchild Industries, Inc.
Ford Motor Company
General Electric Company
General Motors Corporation
Goodyear Tire & Rubber Co.
Gould, Inc.
Harris Corporation
Hercules, Inc.
Honeywell, Inc.
ITT Corporation
International Business Machines
Mobil Corporation
Morton Thiokol, Inc.
Motorola, Inc.
Penn Central Corporation
RCA Corporation
Reynolds (R.J.) Industries, Inc.
Royal Dutch Petroleum Co.
The Signal Companies, Inc.
Singer Company
Sperry Corporation
TRW Inc.
Teledyne, Inc.
Tenneco, Inc.
Textron, Inc.
Todd Shipyards Corp.
Westinghouse Electric Corp.

TABLE 4
SAMPLE OF 13 DOD ORIENTED DOD PRIME CONTRACTORS

Boeing Company
FMC Corporation
General Dynamics Corp.
Grumman Corporation
Litton Industries Inc.
Lockheed Corporation
Martin Marietta Corp.
McDonnell Douglas Corporation
Northrop Corporation
Raytheon Company
Rockwell International Corp.
Sanders Associates, Inc.
United Technologies Corp.

IV. PROFITABILITY OF DOD CONTRACTORS--THE MACRO VIEW

A. GENERAL

The ratio of net income to net worth and the rationale for its selection as the measure of profitability was previously addressed in Chapter I. The macro view of profitability presented in this chapter uses this measure and approaches the question in four specific ways. First, returns for all sample groups are summarized in tabular form and graphed for comparing relative profitability trends. Next, the differences in the data are tested to ascertain significance using statistical hypothesis testing. Third, the question of relationships between the proportion of DOD sales to total sales and profitability is examined using regression analysis. Fourth, the elements of risk are addressed, again using statistical techniques to analyze volatility in historical profits. Chapter V will utilize a similar approach on a micro basis in taking a closer look at the profitability of the 13 DOD-oriented contractors' specific business segments and their related risks.

B. The Profitability Dimension 1980-1984

As a starting point for this discussion, TABLE 5 has been constructed. It includes profit averages for all the samples on an annual basis for the period 1980-1984. The standard deviation, a widely used measure of variability within a data set[1], is indicated in parentheses.

TABLE 5
SUMMARY NI/NW DATA for SAMPLE GROUPS

Year	Fortune "250"	49	36	13
80	.1493(.07)	.1570(.07)	.1545(.08)	.1638(.05)
81	.1395(.07)	.1388(.08)	.1411(.08)	.1324(.06)
82	.1108(.07)	.1372(.09)	.1215(.08)	.1808(.11)
83	.1039(.07)	.1397(.06)	.1252(.05)	.1703(.05)
84	.1326(.08)	.1646(.08)	.1471(.08)	.2133(.06)
Mean	.1272	.1474	.1378	.1721
N	1250	245	180	65

To compare the overall profitability of prime DOD contractors with like-sized "civilian" firms[2], the 49 and the sub-groups of 36 and 13 are compared to the *Fortune* "250" on the basis of annual profit rates i.e. the NI/NW measure. The profitability data summarized in TABLE 5 leads directly to the conclusion that prime contractors have been more profitable than their commercially-oriented, like-sized competitors in the 80's. In fact, the 49 have consistently outperformed the *Fortune* "250". A specific qualification is in order: these data show *only* that a sample of 49 firms which are DOD contractors and whose total proportion of DOD sales to total sales range from less than one percent to as high as eighty percent has been more profitable when compared to a group of 250 like-sized firms. The significance of this comparison can be easily overstated, and viewing selected data of TABLE 5 in graphical form is perhaps more meaningful.

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[1] See Carrol [Ref. 17] and Greer and Liao [Ref. 18]. These researchers use the standard deviation as a measure of variability.

[2] Though the *Fortune* "250" includes nearly 90 percent of the 49 companies and thus is not a statistically "pure" comparative base, the influence of the 49 is reduced by the relative size of the comparative base.

In Figure 3, it is apparent that the sample of 49 firms has performed better than the Fortune "250" firms, particularly in the last three years. However, a closer look at the 49 is necessary to clarify the internal effects of the two other samples included therein.

In Figure 4, the 36, the 13, and the Fortune "250" are compared using the same measure and scale. Here the data support a somewhat different and more precise conclusion. When plotted separately, there is a clear separation between the 13 DOD-oriented firms and the 36 commercially-oriented firms that appear to follow the Fortune "250" more closely. This would suggest some correlation between profitability and volume of DoD business. The strength of this correlation will be discussed later.

While the data in TABLE 5 and Figures 3 and 4 support the conclusion of greater profitability accruing to those who take on sufficient work to qualify as prime contractors, it is necessary to statistically measure the significance of the the differences in profits using a standard hypothesis test.

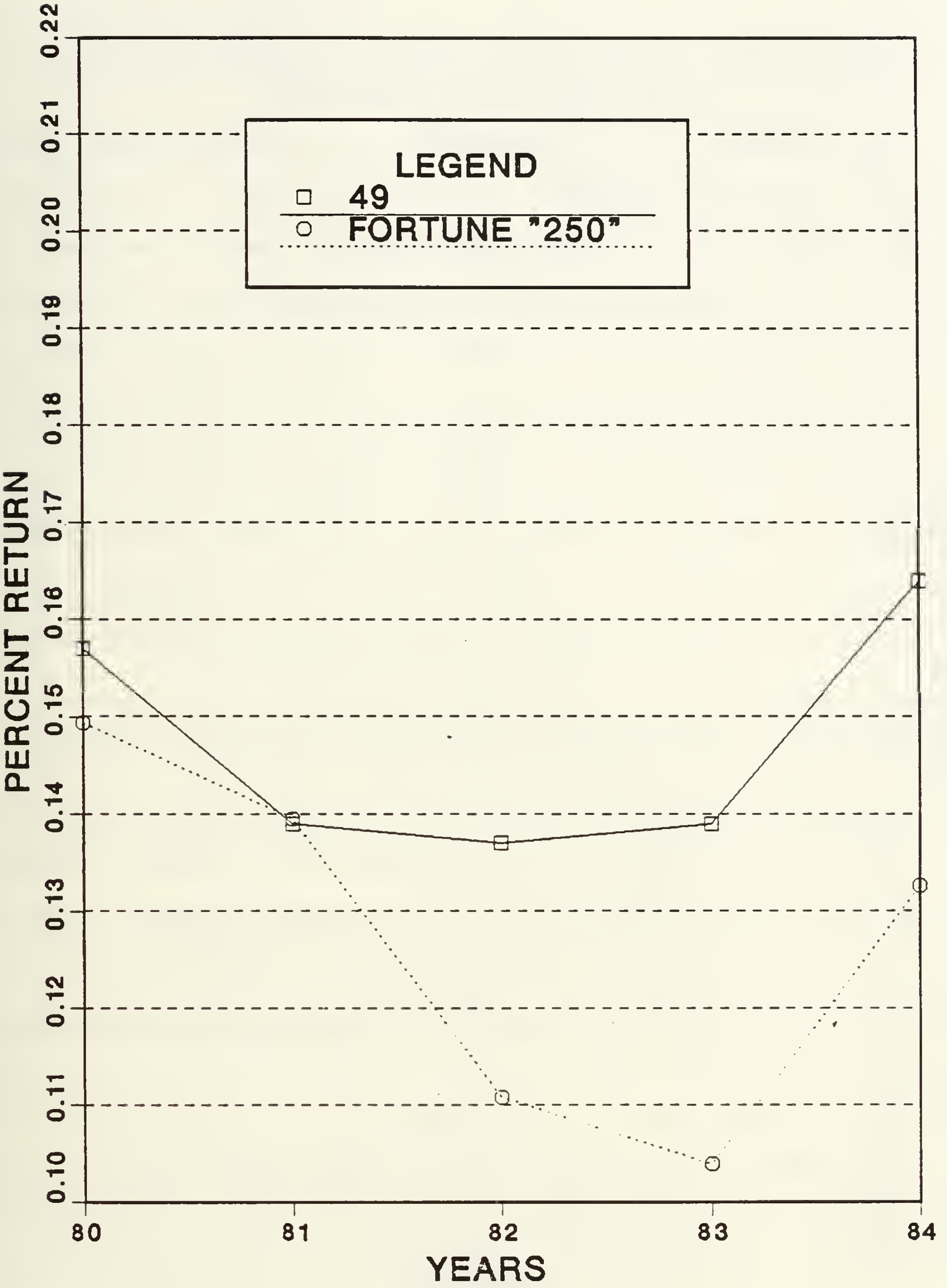

Figure 3. Profitability of the FORTUNE 250 and 49 DOD Contractors

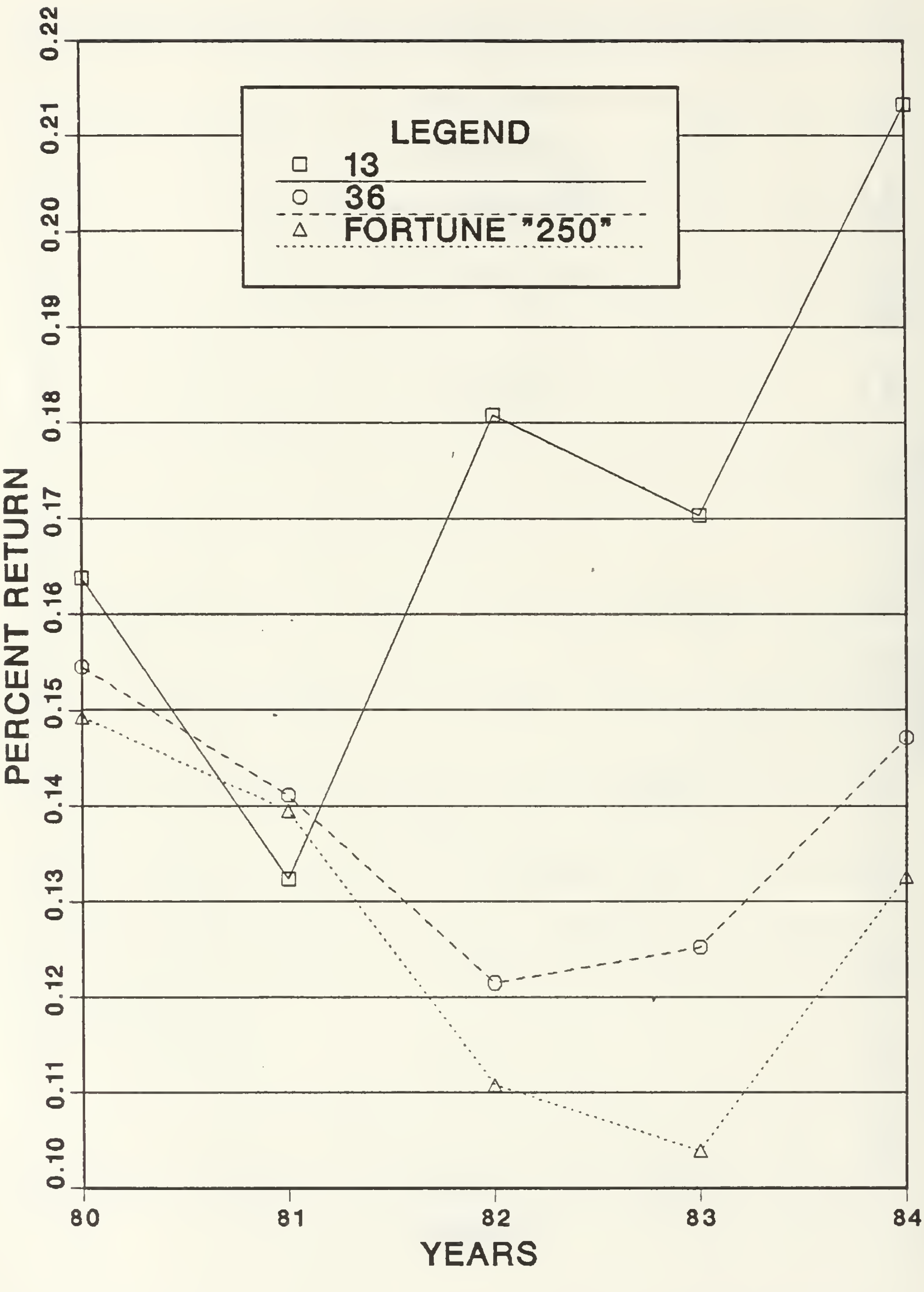

Figure 4. Profitability of the FORTUNE 250 and 36 AND 13 DOD Contractors

C. HYPOTHESIS TESTING

Hypothesis testing involves application of a common statistical technique to support conclusions about a population or sample of interest. In this case, the testing is aimed at the equality of means and consists of specifying a null hypothesis (Ho), a research hypothesis (Ha), a test statistic, and a level of confidence or risk criterion for accepting or rejecting the null hypothesis. The null hypothesis in this case is that the profit rates from the samples of 49, 36, and 13 were drawn from the same population as the Fortune "250". The research hypothesis is that the samples were not drawn from the same population. A t-test of Ho: $u_1=u_2$ versus Ha: $u_1 \neq u_2$ results in a test statistic[3]. A 95 percent confidence level was selected. The hypothesis testing was done using the MINITAB statistical computer program. Because the samples were selected on different criteria and because of the nearly equal standard deviations as shown in Table 5, the assumption of independence of samples was sufficiently supported.

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[3] The MINITAB "Twosample" command uses the following test statistic for the t-test of Ho: $u_1=u_2$ versus Ha: $u_1 \neq u_2$:

$$t = \frac{(\bar{X}_1 - \bar{X}_2)}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

Here x_1 is the sample mean of the first sample, x_2 is the sample mean of the second sample, s_1 and s_2 are the sample standard deviations, and n_1 and n_2 are the two sample sizes.

Statistically, the spread in profits presented in TABLE 5 is not nearly so stark when all three samples are compared to the "250". In the years 1980, 1981, and 1982, the null hypothesis of equal means was supported at the 95 percent confidence level. In other words, the mean profits were so close that there was no statistical significance to the differences, accepting a 5 percent chance of error. In 1983, the null hypothesis was rejected for all three samples and in 1984, it was rejected for the 49 and 13.

Thus, on the basis of the hypothesis tests, prime DOD contractors' profits were no different than those firms represented in the Fortune "250" in 1980-1982. For 1983 and 1984 , however, there is a marked difference. In 1983, there was less than 1 percent probability that the samples came from the same population. In 1984, the same result was observed for the 49 and 13. The 36 had profits very close to the "250" and were considered equal.

On balance, the results of statistical testing for the equality of means are mixed. While there are no consistent trends over the 5 year period, the profit spread between DOD prime contractors and like-sized firms has become statistically significant in the last two years. A likely explanation for these statistical results is the delayed effect of the defense buildup outlined in Chapter 1. Sales and revenues will lag contract awards. Whether this signals the beginning of a trend is merely speculation.

D. REGRESSION ANALYSIS

The next issue is to examine the relationship between the ratio of DOD business to total business and profitability to determine whether any correlation exists. Regression analysis is the statistical technique used to test the hypothesis of a linear relationship between two variables.

First, each of the 49 firm's DOD sales were divided by total sales on an individual firm basis to obtain the ratio of DOD business (PCTDOD). Using the MINITAB statistical package with PCTDOD as the independent variable, the NI/NW profit measure was regressed. Among the statistical data resulting from the test are several key elements: the constant or Y-intercept value, the regression equation with the standard error of the coefficient and the R-squared value. These data are given in TABLE 6.

TABLE 6
SELECTED REGRESSION DATA, PCTDOD vs NI/NW

Year	Constant	Sign/Value of Coefficient	Std. Error of Coefficient	R^2
80	.144	+ / .0709	.053	.036
81	.131	+ / .0381	.057	.009
82	.107	+ / .135	.051	.125
83	.114	+ / .102	.031	.183
84	.142	+ / .0951	.049	.073

Briefly, these selected regression data reveal the strength of the relationship between the variables and the "fit" of the regression line. The constant or Y-intercept value indicates the theoretical profit rate with no government sales. This is the starting point for the linear relationship between profits and PCTDOD.

The coefficient sign provides evidence of any direct relationship between profitability and PCTDOD. The coefficient value is the slope (i.e., the change in y or profitability divided by the change in x or PCTDOD) of the regression line and is the predicted change in profitability per unit of increase in PCTDOD. In 1980, for example, the COEFF value of .0709 means that a 10 percent increase in PCTDOD results in a .709 percent increase in profitability. The standard error of the coefficient permits a quick t-test of the coefficient. Dividing the coefficient by its standard error results in the t-ratio. The higher this ratio, the more unlikely that the coefficient is a random variation from zero. Generally t-ratios greater than 2 strongly support the conclusion that the coefficient is not equal to zero. The R^2 is the "coefficient of determination" and indicates the strength of relationship between the variables.

Looking at the data, the constants (y-intercepts) are reasonably consistent with the Fortune "500" mean profit rates and reveal the expected profitability with no DOD sales. While this is a value derived statistically from a sample population that all have government sales it is still a useful measure. The sign of the COEFF is positive in all 5 years. This reveals that a direct relationship exists between PCTDOD and profits. Specifically, as DOD sales increase, so does profitability. However, the sign of the COEFF must be related to its value or slope. For all five years, the slope is remarkable because of its flatness, nearly horizontal. Based on this fact alone, many would argue that the regression is meaningless. The t-ratio calculated by dividing the coefficient by its standard error strongly supports the hypothesis that the coefficient is not equal to zero in 1982 and 1983 only. In other years, its value is less than 2. The R^2 data also support such a conclusion.

The value of R^2 indicates the strength of the linear relationship between the independent and dependent variables. Its value ranges from 0 or no predictive value to 1 or perfect predictability and indicates the percent of total error "explained" by the regression line equation. In general, the higher the R^2 value, the better the fit of the regression line. For example, in 1983, the R^2 of .183 means that 18.3 percent of the total residual error (i.e. deviations of actual values from those predicted by the regression equation) is explained by the regression line. Stronger linear relationships imply better predictability and higher R^2 values.

For the question of the relevant range, wide variations between predicted and actual values are flagged as part of the MINITAB regression program. Examination of these results reveals that most of the regression errors occurred at the high and low values of PCTDOD, i.e., where PCTDOD exceeded 60 percent or was less than 9 percent. A further series of regressions was run to determine if any specific range reduced the total error of the regression and increased the correlation (R^2) between the variables. Various ranges of PCTDOD were selected[4] and regressed and the resulting R^2 values recorded. The results of these selected regressions were inconclusive. The highest R^2 values were obtained in the 30-70 percent range with the highest R^2 value of .489 in 1983. Thus, while a relevant range has been established, the R^2 value makes such a range statistically inconclusive.

In summary, the regression analysis indicates that a direct relationship between PCTDOD and profitability exists. However, the R-squared and the flat slope of the regression line confirm only a weak relationship that many statisticians would immediately reject. The hypothesis that profitability increases with volume of DOD business has been supported with limited and weak statistical evidence. The relationship is strongest when the firms' PCTDOD falls in the 30-70 percent range. One must conclude that there is little or no apparent relationship between the proportion of DOD sales and profitability.

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[4] Ranges of PCTDOD on the low end (i.e. 0.0-.30) and the high end (i.e. .40-.99) in addition to various middle combinations (i.e. .30-.60, .20-.70, etc.) were tested. Because these ranges approximated a separate regression series for the group of 36 and 13, regressions for these specific groups are not reported.

E. RISKS vs RETURNS

Risk, like profit, has many definitions, most of which depend on point of view. At the macro level, risk may be broadly equated to uncertainty or volatility of profits over time. A useful and revealing measure of risk is the standard deviation of mean profit rates observed over time. The idea here is that greater variability or spread in data from the mean will be reflected in a larger standard deviation, indicating greater risk. In economic terms, the marketplace establishes the risk-free rate (usually taken to approximate the current rate on government-issued Treasury notes [Ref. 6: pp 26-44 and Ref. 19]), and greater risk exposure would entail adding a risk premium to the risk-free rate to compensate risk-averse lenders and investors. The purpose of this section is to assess the generally higher returns of DOD contractors in terms of their risk exposure.

For the purposes of comparison, selected profitability data of TABLE 5 is repeated in TABLE 7. Ignoring the profit rate itself, it is clear that the variability in returns for the Fortune "250" and the 49 is roughly equivalent. The 36 is similar. In contrast, the 13 DOD-oriented contractors have the single highest variation (.11) and the four lowest (.05 and .06).

Figure 5 is a two panel graph based on TABLE 7 that compares profit rate (top panel) and risk as measured by the standard deviation (bottom panel) for each of the years

TABLE 7
NI/NW DATA for the FORTUNE "250", 49,36, and 13

Year	Fortune "250"	49	36	13
80	.1493(.07)	.1570(.07)	.1545(.08)	.1638(.05)
81	.1395(.07)	.1388(.08)	.1411(.08)	.1324(.06)
82	.1108(.07)	.1372(.09)	.1215(.08)	.1808(.11)
83	.1039(.07)	.1397(.06)	.1252(.05)	.1703(.05)
84	.1326(.08)	.1646(.08)	.1471(.08)	.2133(.06)

studied. What Figure 5 reveals is that the 13 DOD-oriented contractors have attained higher profits and have been exposed to lower risks. However, there are two contradictions in this conclusion: in 1981, defense contractors' profit rate was slightly less than that of the 250 (.1324 vs .1395), and in 1982, the standard deviation of profits for the 13 exceeded that of the 250 by .03.

In summary, there appears to be no relationship between profitability and risk during the period. Higher profits do not entail greater risks. In a like manner, lower profits do not carry lower risks. Some would argue that this type of analysis is overly simplistic and fails to capture risk adequately. However, at the macro level and using aggregated data, it shows that defense contractors composing the 13 enjoy a greater profitability and that those profits are subject to generally less variation over time. While the evidence supporting this conclusion is certainly not overwhelmingly persuasive, extending this type of comparison over a longer period might be useful for future research.

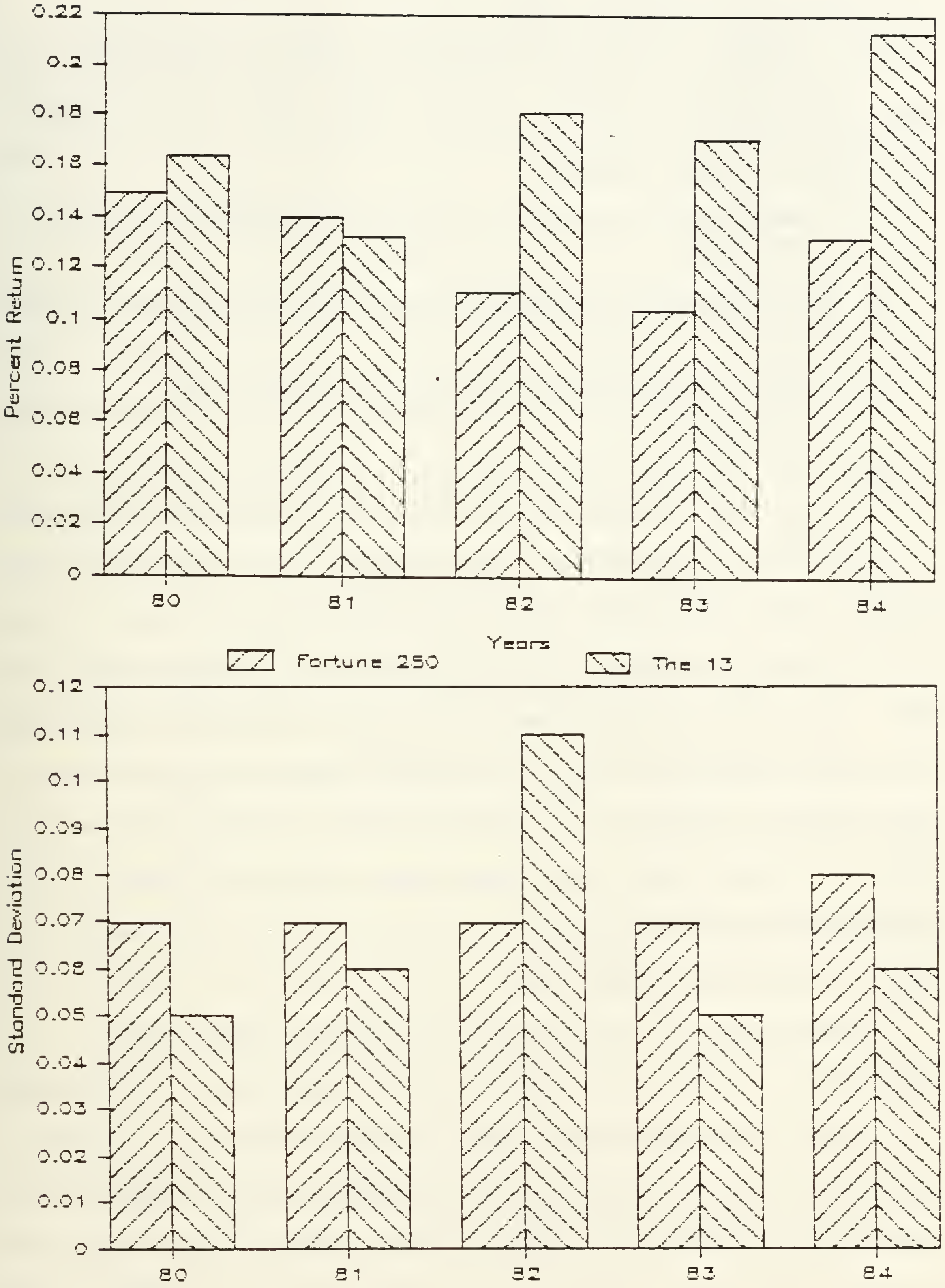

Figure 5. Rewards vs. Risks of DOD Contracting

F. SUMMARY AND CONCLUSIONS

The purpose of Chapter IV was to address the question of profitability of DOD contractors at the macro level using four separate approaches:

(1) summarizing profitability for all sample groups for comparison.

(2) statistically testing differences in profitability to determine significance.

(3) using regression analysis to determine the relationship between profitability and volume of DOD business.

(4) examining the risk exposure of DOD contractors revealed in the volatility of their profits over time.

Approach 1 was merely a data summary that supported the general conclusion of greater profitability of DOD contracting. This conclusion was refined by separating the 49 into its component subgroups of 36 commercially-oriented and 13 DOD-oriented firms. Here, the data show a significant profit spread for the 13 during the last 3 years. So, on the basis of actual data, DOD contracting for the prime contractors has been more profitable than the commercial ventures of like-sized firms.

In approach 2, the general conclusions drawn from observing the data are tested using statistical methods. Here the results are mixed and less conclusive than in the first approach. Despite the apparent absolute spread, profit rates were statistically equivalent for all groups from 1980-1982. In 1983 and 1984 , however, the higher profits of the 49 and 13 were statistically significant. So, while the DOD figures are consistently higher, conclusions must be tempered with statistical evidence. Thus, on the basis of hypothesis testing, conclusions are limited to annual comparisons only, rather than long term trends.

The question of DOD profitability as a function of the volume of DOD business is the focus of approach 3. The 49 firms' relationship of profits to volume of DOD business was established using a regression equation derived from the actual data. The results were largely inconclusive. A weak relationship exists between profitability and the volume of DOD business even when regressing profit on various ranges of DOD business volume. The slope of the regression line and the R^2 values support no strong conclusions that more DOD business will result in more or less profitability. On balance, the regression analysis revealed little or no relationship between profitability and PCTDOD. To generalize this conclusion, once a firm joins the ranks of the `Top 100', there is little incentive to increase the proportion of DOD business, provided it has profitable commercial alternatives. Whether at 1 percent or 60 percent, there appears to be no promise of greater profitability as the sales mix favors DOD. Porter [Ref. 20] includes a growth/share matrix developed by the Boston Consulting Group (BCG) that reveals the impact of such a profitability-market relationship.

Finally, the volatility of profits was used as a measure of risk. In this context, the standard deviation of historical profits was equated to risk and was analyzed to determine if DOD contractors are exposed to more or less risk than their like-sized counterparts engaged in commercial enterprise. The results were, that for the time frame studied, DOD contracting has been both more profitable and less risky than commercial business.

V. PROFITABILITY OF DOD CONTRACTORS - THE MICRO VIEW

A. GENERAL

Chapter IV addressed the question of overall profitability of DOD contractors at the macro level. This Chapter follows a similar methodology in looking at the corporate structure of eleven of the thirteen government oriented contractors. Here the study is aimed at the micro level, examining individual corporate business entities or segments that contribute to the overall profitability of the firm. Thus, this Chapter tries to address the question of how the operating profits of the segments involved principally in government business compare to the other segments of the 11 DOD oriented prime contractors identified in TABLE 8.

TABLE 8.
SAMPLE OF 11 DOD PRIME CONTRACTORS

Boeing Company
General Dynamics Corp.
Litton Industries Inc.
Martin Marietta Corp.
Northrop Corporation
Sanders Associates,Inc.
FMC Corporation
Grumman Corporation
Lockheed Corporation
McDonnell Douglas Corp.
Rockwell International Corp.

Note: This table is identical to TABLE 4. except for two corporations not presented here, United Technologies Corp. and Raytheon Company.

Viewing the question of profitability at the micro level consists of four separate steps. First discussed is the method of disentangling the business segments into government and commercial. Second, the selection of an appropriate profitability measure is made. Third, the segments of all the contractors are pooled in like categories and then compared to each other on an intercompany basis. Finally, an intracompany comparison of the profitability of the segments is summarized and graphed.

B. THE SEGMENTS

A segment is broadly defined as a distinguishable part or subset of a company on which revenue and cost data are accumulated. Examples of segments might include major customers, manufacturing divisions, functions, producing departments, operations, and product lines.

The original plan for this study was to separate the segments of the prime DOD contracting corporations into government oriented and nongovernment oriented on the basis of sales and then to compare the individual segment's profitability. After reviewing the SEC Form 10K reports and the financial statements of the corporations selected for study, the separation of the segments as originally conceived was considered infeasible in many cases. For example, some corporations clearly separate their segments by sales into government and nongovernment business. Others report sales to the government as a percentage of segment sales, and still other corporations only present the portion of government sales as a percentage of total company sales. It is important to note that total sales to the government are used in this context, not just DOD sales. Government sales represent the lowest level of corporate financial reporting and attempts to disentangle DOD from total government sales on a segment basis were unsuccessful. Additionally, net worth in each case is reported for the corporation as a whole and is not divided, nor is it divisible among the segments. Herein lies the problem previously addressed in Chapter I: how to separate the segments? An additional problem was that after they were separated, by what measure could the segments be compared?

Several studies have argued against the feasibility of separating the segments for these reasons and others pertaining to the externalities of government related business[1]. Two examples of externalities are patents and the costs of recruiting and training personnel. Both of these may have resulted from a government contract and subsequently used for nongovernment production and vice versa.

Some of these cautions remain valid today. However, two qualifications support this portion of the study.

(1) Before 1977, segment reporting was not required by the Financial Accounting Standards Board (FASB), and the information needed to disentangle the corporate segments was not readily available to researchers. Since 1977, corporations have reported segment financial data, though the requirements remain broad enough to permit great variation in reporting today.

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[1] See for example Poirer and Garber p.224 [Ref. 21] and Boni p.722 [Ref. 16].

(2) By using operating margin defined in Chapter I (operating profit divided by sales) as the measure of profitability, the problems related to net worth and other measures that pertain only to the corporation as a whole are avoided. The segment profitability measure will be further discussed later in this Chapter.

In addressing the first problem of separating the segments, it was found that, of the thirteen prime contractors having DOD business of 30 percent or greater in total sales, eleven reported total government sales clearly enough to identify the percentages attributable to each segment. TABLE 8 lists those eleven contractors. The segments were then graphed on their proportion of government sales. Three distinct categories, government, commercial and neutral resulted from the bi-modal distribution of the percentages of government related sales. Figure 6 shows the distribution of the segments by percentages. Segments reporting 80 percent and above closely approximate exclusively government oriented segments and were titled "government". Those reporting 20 percent or less were designated "commercial" and the balance of the segments, ranging from 50 percent to 70 percent, "neutral". The resulting numbers of segments in each category amounted to 17 government, 20 commercial and 4 neutral, totaling 41 segments studied. When a segment was acquired, formed, sold or dissolved within the time frame of this study, the data were evaluated only for the time period of the segment's existence. For example, in one case, only three years' data were used because a segment was sold.

```
                      PERCENT    NUMBER

                         00          17  |*****************
                        .05           1  |*
Commercial              .10           0  |
                        .15           1  |*
                        .20           1  |*
- - - - - - - - - - - -.25- - - - -   0  |
                        .30           0  |
                        .35           0  |
                        .40           0  |
                        .45           0  |
Neutral                 .50           2  |**
                        .55           0  |
                        .60           1  |*
                        .65           0  |
                        .70           1  |*
- - - - - - - - - - - -.75- - - - -   0  |
                        .80           1  |*
                        .85           0  |*
Government              .90           9  |*********
                        .95           4  |****
                       1.00           3  |***
```

Figure 6: Distribution of Government Sales by Segment

C. THE PROFITABILITY MEASURE

Considering the limitations in analyzing and comparing segments, the measure chosen for comparison of profitability is operating margin (segment operating profit, divided by total segment sales). Historically, operating margin is considered a profitability measure that is related directly to efficiency. It indicates the efficiency of operations and the pricing strategy of the company or segment. Operating margin is not accepted universally for use as the sole measure in comparing corporate profitability. When used singularly as the comparative measure, operating margin can be misleading[2]. One might also argue that comparing the two distinct segments, government and commercial, assimilates an interindustry comparison (the problem of externalities previously mentioned) and invalidates operating margin as an effective measure [Ref. 17: p.547]. Finally, operating margin does not distinguish between subcontracted products and those due to the results of in-house effort (value added). Some would argue that this fact biases the data by artificially inflating both sales volume and operating profit.

However, four points strengthen the analysis based on this measure. First, the restrictions of this study confine the comparisons to the eleven prime contractors that derive significant portions of their profits from sales to the government. Second, no attempt is made to project the findings to the company as a whole or to judge the profitability of the segments in comparison to any firms outside the study. Third, the comparisons are only valid when viewed over time and with the segments of prime contractors. Fourth, studies have shown that a significant level of subcontracting is widespread through all industry, so the variability that would be caused by this factor is again neutralized by restricting the comparisons to the eleven defense contractors in this study.

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[2] To demonstrate the weakness in using profit as a percent of sales, Fox [Ref. 22: p.309] uses the following illustration: "If a contractor uses government owned equipment in a government owned plant and receives frequent progress payments, he may have a relatively small investment in his defense operations. Thus on a $1 million contract for which he receives a profit of $100,000 and invests $200,000, profit would represent a 10% return on sales and a 50% return on investment."

Therefore, operating margin is considered a relevant measure for this study and may be the only viable measure for comparing segments. Using this measure, the next section will compare segments within the field of government contractors, i.e., intercompany, and the following section will compare segments within a company, i.e., intracompany.

D. INTERCOMPANY COMPARISONS

This section concentrates on comparing the government segments with the commercial segments on an intercompany basis. To enable this comparison, all 41 segments were first pooled by category and year. The totals were then averaged and the standard deviations were derived. The results of these calculations are shown in TABLE 9 and Figure 7, with the standard deviations enclosed in parentheses. In Figure 7, a third line, interposed as a frame of reference, represents the averaged annual operating margins for all U. S. manufacturing firms, accumulated by the U. S. Department of Commerce, Bureau of the Census [Ref. 23: p. XXVIII]. Immediately apparent from the graph are two points. First, the government segments have consistently outperformed the commercial segments. Second following the risk discussion in Chapter IV, the spread of the data (indicated by the standard deviations) is significantly greater in the commercial segments than in the government segments.

TABLE 9
POOLED OPERATING MARGINS - ANNUAL MEANS

YEAR	COMMERCIAL	GOVERNMENT	MANUFACTURERS
1980	.082 (.056)	.089 (.042)	.076
1981	.052 (.108)	.094 (.042)	.074
1982	.024 (.121)	.082 (.024)	.053
1983	.044 (.060)	.090 (.026)	.062
1984	.069 (.078)	.088 (.032)	.071
TOTAL N	96	83	

The apparent differences in operating margins can be addressed in two ways: materially and statistically. The conclusions stemming from each approach are considerably different. First, on a material basis, the data show a consistently superior performance by the government segments when compared to the commercial segments. Second, when statistically measured over the five year period using the standard hypothesis test (previously explained in Chapter IV) of the null hypothesis that these sample means were drawn from populations with identical population means, the null hypothesis cannot be rejected at the 95 percent level, except for one year, 1983. Phrased differently, the mean operating margins were so close or the variations so large that in all but one year the differences were not statistically significant.

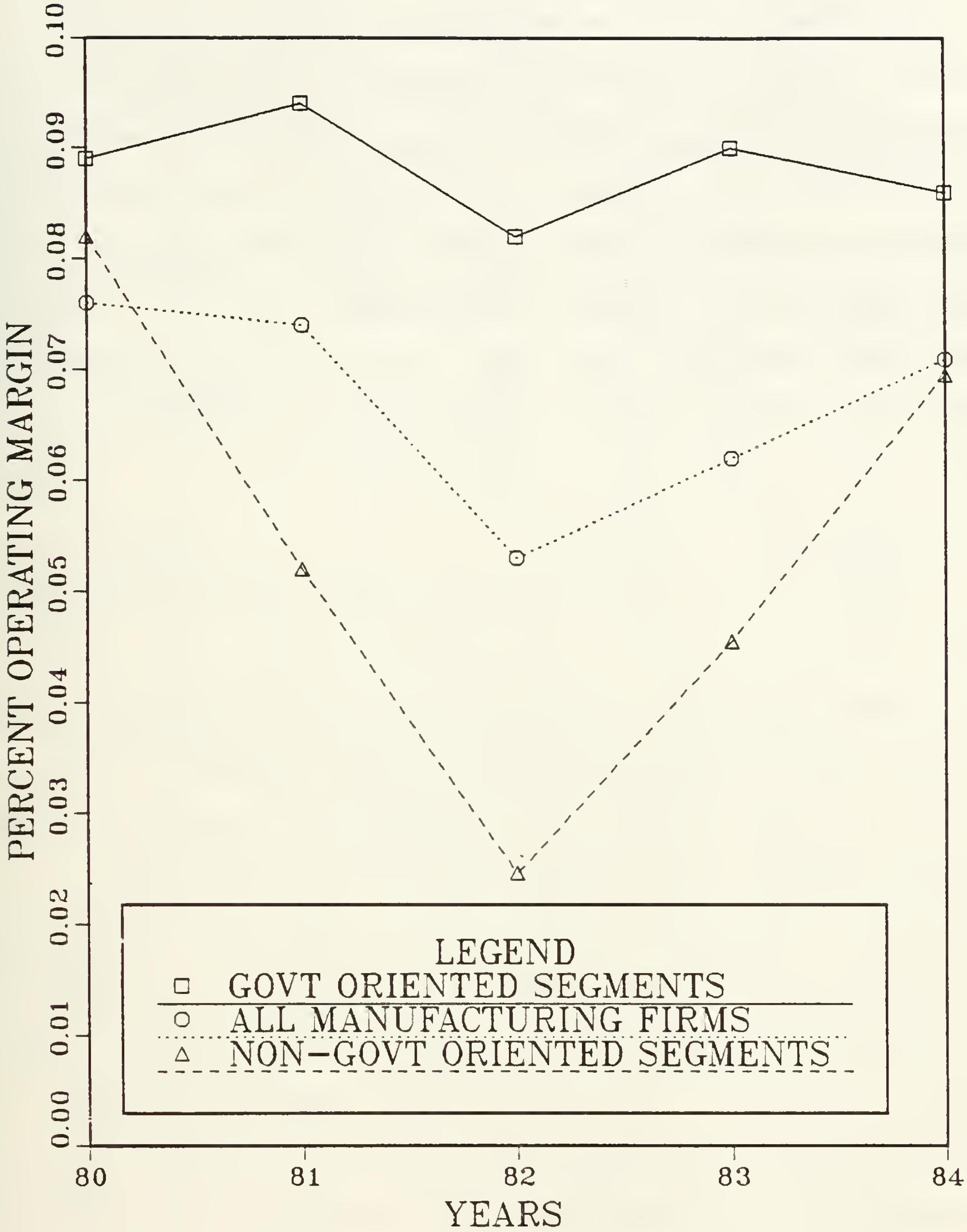

Figure 7. Pooled Operating Margins (Intercompany)

In summary, there is an obvious material difference between the two categories of segments, with the government segments repeatedly outperforming the commercial segments. However, from the standpoint of the hypothesis tests, the operating margins of the government segments were no different than the commercial segments, except for 1983. In that year, there was less than 1 percent chance that the two operating margins came from the same population.

E. INTRACOMPANY COMPARISONS

This discussion is centered on the performance of the government, commercial, and neutral segments within each of the eleven prime contractors. TABLE 10 is a composite of the means of operating margins for the three categories of segments. Within each of the companies, the operating margins for the segments were combined into the corresponding categories and then averaged over the five year period. The standard deviation, indicated in parentheses, is presented as a measure of variability. From the summarized data in TABLE 10, it is evident that the government segments returned higher operating profits on sales than the commercial segments. The relationships of the margins may be more understandable by viewing them graphically.

Figure 8 shows that in seven of the eleven firms, the government segments performed significantly better than corporate commercial segments. The neutral segments'

TABLE 10

SEGMENT OPERATING MARGINS - 5 YEAR MEANS

COMPANY	COMMERCIAL	GOVERNMENT	NEUTRAL
Boeing	.030 (.036)	.095 (.025)	
FMC	.078 (.079)	.099 (.016)	
General Dynamics	-.039 (.168)	.059 (.033)	
Grumman	.036 (.087)	.085 (.012)	
Litton	.095 (.051)	.116 (.026)	.099 (.008)
Lockheed		.081 (.027)	.104 (.017)
Martin Marietta	.079 (.068)	.076 (.004)	
McDonnell Douglas	.015 (.037)	.068 (.017)	
Northrop	.046 (.086)	.139 (.032)	.007 (.062)
Rockwell	.078 (.043)	.079 (.017)	.084 (.012)
Sanders	.099 (.023)	.095 (.043)	
TOTAL SEGMENTS	20	17	04
GRAND MEAN	.054	.088	.075
TOTAL N	96	83	20

performance split evenly in comparison to the government segments. The numbers in parentheses in Figure 8 show the number of segments represented by each of the bars.

The data are further broken down by year, segment and corporation in the Annex following this Chapter. Additionally, included in the Annex are the "betas" of the eleven corporations for each of the five years covered in this study. Beta is a "risk" measure that, as defined by *The Value Line*, is derived from a regression analysis between weekly percent changes in the price of a stock and weekly percent changes in the New York Stock Exchange Composite Index over a period of five years. The betas are not viable measures for use in segment analysis, but they are included in the Annex as indicators of the respective firms' stability

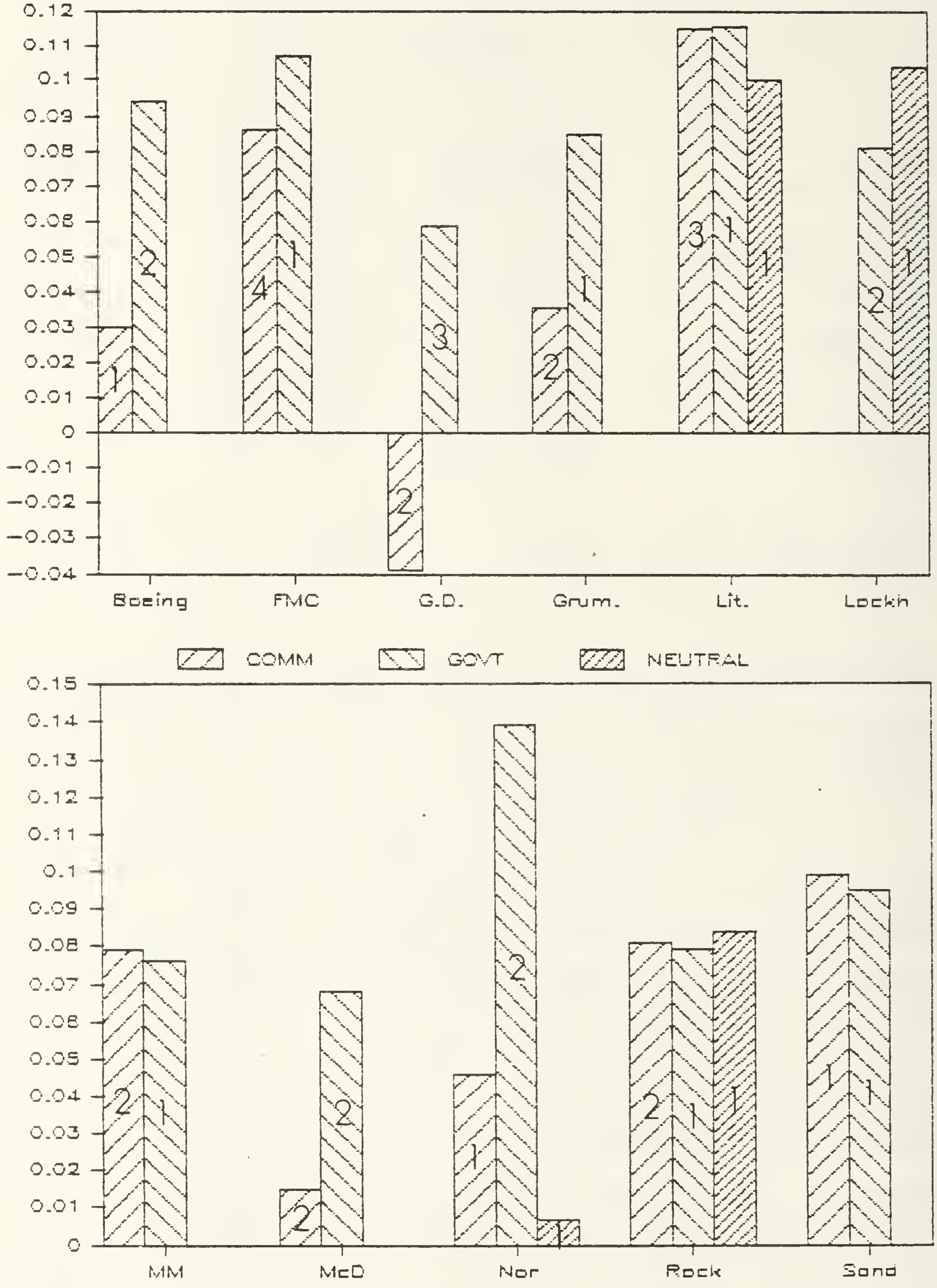

Figure 8. Segment Operating Margins (Intracompany)

compared to the overall market (beta = 1). The betas and portions of the other corporate information included in the Annex were obtained from The Value Line.

E. SUMMARY AND CONCLUSIONS

The goal of this Chapter was to assess the profitability of eleven prime contractors at the micro level. To do so required disentangling corporate segments and then comparing their profitability. Two approaches were taken:

(1) an intercompany comparison. The first approach in comparing the segments involved pooling the segments by category and then averaging the totals over the five years of study.

(2) an intracompany comparison. The second approach involved looking within the corporations and comparing the operating margins of the three identified categories, government, commercial and neutral.

In general, the results of these comparisons show conclusively that the government segments have been more profitable during the last five years than have the commercial segments as measured by operating profit divided by sales. For the intercompany comparison, there was a significant material spread between the operating margins of the government and commercial segments. Even though the hypothesis testing did not verify this significant difference in means statistically, the consistency of the material difference cannot be ignored.

The intracompany comparison provides firm by firm support for the conclusion of greater profitability of government segments. Here the segments within each firm were compared, and, in seven of the eleven firms, government segments were more profitable by an average of 4 percent. Further, this greater profitability is accompanied by a much smaller standard deviation which equates to less variability or volatility in the government segments' operations.

BOEING COMPANY

1. The Boeing Company is the leading producer of commercial jet aircraft. Producing the 737, 747, 757 and 767, Boeing also manufactures missiles (Minuteman, ALCM), helicopters (CH-46, CH-47), E-3 AWACS, E-4 command post, E-6 submarine communicator, hydrofoil boats, ground transportation systems, and works on the MX missile.

2. Sales to the government have averaged 34 percent of total revenues for the period 1980-1984.

3. Corporate segments include: Commercial Transportation, Military Transportation, and Missiles and Space.

OPERATING MARGINS

() - Signifies Negative Number

SEGMENTS	1980	1981	1982	1983	1984
Comm. Trans.	.090	.040	.003	.014	.003
Mil. Trans.	.084	.132	.113	.110	.111
Miss. & Spac.	.050	.058	.102	.090	.095
BETA	1.25	1.20	1.25	1.20	1.15

OPERATING MARGIN FIVE YEAR MEANS PER SEGMENT

(CCC - Commercial Segments, GGG - Government Segments)
(NNN - Neutral Segments, () - Signifies Negative Number)

```
 OP MARG
       |
   .15 |- - - - - - - - - - - - - - - - - - - - -
       |
       |
       |
       |                  GGG
   .10 |- - - - - - - - -GGG- - - - - - - - - -
       |                  GGG
       |                  GGG
       |                  GGG
       |                  GGG           GGG
   .05 |- - - - - - - - -GGG- - - - - -GGG- - -
       |                  GGG           GGG
       |     CCC          GGG           GGG
       |     CCC          GGG           GGG
       |     CCC          GGG           GGG
  ----------------------------------------------
            COMM.         MIL.          MISS. &
            TRANS.        TRANS.        SPACE
```

FMC CORPORATION

1. FMC Corp. is the world's largest producer of natural soda ash and manufactures and sells other chemicals and machinery. The machinery is sold for industrial, agricultural and defense use.

2. Sales to the government have averaged 32 percent of total revenues for the period 1980-1984.

3. Corporate segments include: Industrial Chemical, Petroleum Equipment Services, Defense Equipment and Systems, Performance Chemicals and Specialized Machinery.

OPERATING MARGINS

() - Signifies Negative Number

SEGMENTS	1980	1981	1982	1983	1984
Indus. Chem.	.135	.148	.154	.168	.182
Pet. Equip.	.173	.203	.160	(.033)	(.093)
Def. Equip.	.126	.092	.082	.099	.135
Perf. Chem.	.034	.125	.030	.061	.105
Spec. Mach.	.017	(.005)	(.057)	(.026)	.063
BETA	1.05	1.00	.95	.95	.95

OPERATING MARGIN FIVE YEAR MEANS PER SEGMENT

(CCC - Commercial Segments, GGG - Government Segments)
(NNN - Neutral Segments () - Signifies Negative Number)

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 OP MARG
     |   CCC
 .15 |- -CCC- - - - - - - - - - - - - - - - - - - - -
     |   CCC
     |   CCC
     |   CCC
     |   CCC              GGG
 .10 |- -CCC- - - - - - - GGG - - - - - - - - - - - -
     |   CCC      CCC     GGG
     |   CCC      CCC     GGG
     |   CCC      CCC     GGG      CCC
     |   CCC      CCC     GGG      CCC
 .05 |- -CCC- - -CCC- - - GGG - - -CCC- - - - - - -
     |   CCC      CCC     GGG      CCC
     |   CCC      CCC     GGG      CCC
     |   CCC      CCC     GGG      CCC
 .01 |   CCC      CCC     GGG      CCC    (CCC)
    ____________________________________________
         IND.     PET.    DEF.     PERF.   SPEC.
         CHEM.    EQUIP.  EQUIP.   CHEM.   MACH.
```

GENERAL DYNAMICS CORPORATION

1. General Dynamics is the largest U. S. defense contractor. Products made include: military aircraft (F-16, F-111 parts), Atlas and Centaur boosters, Tomahawk missiles, tactical missiles, LNG tankers, naval vessels, submarines (SSN-688, Trident), and data devices. Products sold are lime and coal.

2. Sales to the government have averaged 82 percent of total revenues for the period 1980-1984.

3. Corporate segments include: Government Aerospace, Government Shipbuilding, Commercial Shipbuilding, Land Systems and Other.

OPERATING MARGINS

() - Signifies Negative Number

SEGMENTS	1980	1981	1982	1983	1984
Gov. Aerosp.	.069	.082	.095	.100	.103
Gov. Shipb.	.026	.010	.026	.060	.094
Comm. Shipb.	.004	(.310)	(.380)	(.006)	.147
Land sys.			.032	.032	.038
Other	.086	.015	.008	.020	.023
BETA	1.30	1.30	1.35	1.30	1.35

OPERATING MARGIN FIVE YEAR MEANS PER SEGMENT

(CCC - Commercial Segments, GGG - Government Segments)
(NNN - Neutral Segments, () - Signifies Negative Number)

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    OP MARG
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         |
     .10 |- - - - - - - - - -  (CCC) - - - - - - - - - -
         |  GGG                (CCC)
         |  GGG                (CCC)
         |  GGG                (CCC)
         |  GGG                (CCC)
     .05 |- -GGG- - - - - - -  (CCC) - - - - - - - - - -
         |  GGG                (CCC)
         |  GGG       GGG      (CCC)
         |  GGG       GGG      (CCC)     GGG       CCC
         |  GGG       GGG      (CCC)     GGG       CCC
         |  GGG       GGG      (CCC)     GGG       CCC
        ------------------------------------------------
            GOV.      GOV.      COMM.    LAND      OTHER
            AERO.     SHIPB.    SHIPB.   SYS.
```

GRUMMAN CORPORATION

1. Grumman Corp. is the largest producer of carrier-based aircraft. Military aircraft include the F-14A, A-6E, EA-6B, KA-6D, E-2C, X-29, and C-2A. Non-aerospace products include truck bodies, canoes, yachts, and special purpose vehicles. Other activities include hydrofoil boats and data processing.

2. Sales to the government have averaged 90 percent of total revenues for the period 1980-1984.

3. Corporate segments include: Aerospace, Information and Financial Services, and Commercial Products, Non-Aerospace.

OPERATING MARGINS
() - Signifies Negative Number

SEGMENTS	1980	1981	1982	1983	1984
Aerospace.	.080	.104	.090	.080	.070
I/F Serv.	.050	.012	.160	.160	.130
Comm. Prod.	.026	(.050)	(.080)	(.020)	(.030)
BETA	1.25	1.30	1.10	1.10	1.05

OPERATING MARGIN FIVE YEAR MEANS PER SEGMENT
(CCC - Commercial Segments, GGG - Government Segments)
(NNN - Neutral Segments, () - Signifies Negative Number)

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    OP MARG
          |
      .15 |- - - - - - - - - - - - - - - - - - - - - -
          |
          |
          |
          |
      .10 |- - - - - - - - - -CCC- - - - - - - - - -
          |                    CCC
          |      GGG           CCC
          |      GGG           CCC
          |      GGG           CCC
      .05 |- - -GGG- - - - - -CCC- - - - - - - - - -
          |      GGG           CCC
          |      GGG           CCC           (CCC)
          |      GGG           CCC           (CCC)
          |      GGG           CCC           (CCC)
          ---------------------------------------------

                 AERO.         INF/FIN        COMM.
                               SERVS.         PROD.
```

LITTON INDUSTRIES INCORPORATED

1. Litton Industries Inc. produces defense electronic systems, material handling equipment, machine tools, computer and microwave components, integrated circuits, motors and drives, avionic instruments, electronic and mechanical components, medical equipment and warships.

2. Sales to the government have averaged 34 percent of total revenues for the period 1980-1984.

3. Corporate segments include: Advanced Electronic Systems, Business Systems, Electronic and Electrical Products, Industrial Systems and Services and Marine Engineering and Production.

OPERATING MARGINS
() - Signifies Negative Number

SEGMENTS	1980	1981	1982	1983	1984
Adv. E. Sys.	.104	.084	.106	.101	.103
Bus. Sys.	.053	.042	(.001)		
E. & E. Sys.	.098	.101	.093	.086	.087
Ind. S. & S.	.180	.170	.162	.090	.085
Mar. E. & P.	.161	.113	.093	.111	.104
BETA	1.40	1.45	1.45	1.40	1.30

OPERATING MARGIN FIVE YEAR MEANS PER SEGMENT
(CCC - Commercial Segments, GGG - Government Segments)
(NNN - Neutral Segments, () - Signifies Negative Number)

```
  OP MARG
       |
   .15 |- - - - - - - - - - - - - - - - - - - - -
       |                            CCC
       |                            CCC
       |                            CCC
       |                            CCC       GGG
   .10 |-  -NNN- - - - - - - - - - -CCC- - -GGG- -
       |    NNN             CCC     CCC      GGG
       |    NNN             CCC     CCC      GGG
       |    NNN             CCC     CCC      GGG
       |    NNN             CCC     CCC      GGG
   .05 |-  -NNN- - - - - - -CCC- - -CCC- - -GGG- -
       |    NNN             CCC     CCC      GGG
       |    NNN     CCC     CCC     CCC      GGG
       |    NNN     CCC     CCC     CCC      GGG
       |    NNN     CCC     CCC     CCC      GGG
     ------------------------------------------
            ADV.    BUS.    E&E     IND      MAR
            E.SYS.  SYS.    SYS.    S&S      ENG
```

LOCKHEED CORPORATION

1. Lockheed Corp. is one of the largest U. S. defense contractors. Aircraft production includes C-130/L-100 and C-5 transports, P-3 antisubmarine warfare and TR-1 reconnaissance aircraft. Rocket production includes Trident and Poseidon missiles and Agena boosters. Other interests include shipbuilding, electronics, and ocean mining.

2. Sales to the government have averaged 55 percent of total revenues for the period 1980-1984.

3. Corporate segments include: Missiles, Space and Electronics Systems, Aeronautical Systems, and Marine and Information Systems.

OPERATING MARGINS
() - Signifies Negative Number

SEGMENTS	1980	1981	1982	1983	1984
M,S & E Sys.	.059	.066	.060	.063	.065
Aero. Sys.	.091	.108	.104	.138	.099
M & I Sys.	.125	.117	.039	.111	.053
BETA	1.55	1.80	1.60	1.35	1.25

OPERATING MARGIN FIVE YEAR MEANS PER SEGMENT
(CCC - Commercial Segments, GGG - Government Segments)
(NNN - Neutral Segments, () - Signifies Negative Number)

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OP MARG
       |
   .15 |- - - - - - - - - - - - - - - - - - - - - -
       |
       |
       |
       |                  NNN
   .10 |- - - - - - - - - -NNN- - - - - -GGG- - -
       |                  NNN            GGG
       |                  NNN            GGG
       |                  NNN            GGG
       |     GGG          NNN            GGG
   .05 |- - -GGG- - - - - -NNN- - - - - -GGG - -
       |     GGG          NNN            GGG
       |     GGG          NNN            GGG
       |     GGG          NNN            GGG
       |     GGG          NNN            GGG
      -------------------------------------------
             M,S&E        AERO.          M&I
             SYS.         SYS.           SYS.
```

MARTIN MARIETTA CORPORATION

1. Martin Marietta Corp. is a major supplier of aerospace launch systems, missile systems, command and control systems, electronic and communication systems, information and data services, and aircraft components. Major systems include Titan III, Pershing II, MX and Space Shuttle. Other activities include aggregates and refractories.

2. Sales to the government have averaged 48 percent of total revenues for the period 1980-1984.

3. Corporate segments include: Aerospace Systems, Basic Products, and Data Systems.

OPERATING MARGINS

() - Signifies Negative Number

SEGMENTS	1980	1981	1982	1983	1984
Aero. Sys.	.073	.071	.076	.083	.078
Basic Prod.	.136	.104	(.050)	.082	.200
Data. Sys.		.051	.051	.057	.052
BETA	1.05	1.15	1.25	1.25	1.25

OPERATING MARGIN FIVE YEAR MEANS PER SEGMENT

(CCC - Commercial Segments, GGG - Government Segments)
(NNN - Neutral Segments, () - Signifies Negative Number)

```
  OP MARG
        |
    .15 |- - - - - - - - - - - - - - - - - - - - -
        |
        |
        |
        |
    .10 |- - - - - - - - - - - - - - - - - - - - -
        |                 CCC
        |    GGG          CCC
        |    GGG          CCC
        |    GGG          CCC
    .05 |- - -GGG- - - - - -CCC- - - - - -CCC- - -
        |    GGG          CCC            CCC
        |    GGG          CCC            CCC
        |    GGG          CCC            CCC
        |    GGG          CCC            CCC
        ------------------------------------------
             AERO.        BASIC          DATA
             SYS.         PRODS.         SYS.
```

MCDONNELL DOUGLAS CORPORATION

1. McDonnell Douglas Corp. manufactures military aircraft (F-15, F/A-18A, AV-8B, C-9, KC-10); commercial aircraft (MD-80, DC-10); spacecraft and missiles (Harpoon, Delta, Tomahawk, Payload Assist Module).

2. Sales to the government have averaged 69 percent of total revenues for the period 1980-1984.

3. Corporate segments include: Combat Aircraft, Transport Aircraft, Space Systems and Missiles, and Information Systems.

OPERATING MARGINS

() - Signifies Negative Number

SEGMENTS	1980	1981	1982	1983	1984
Comb. Air.	.070	.070	.080	.080	.090
Trans. Air.	.060	.030	.040	.030	.026
Spac. S & Mis.	.060	.065	.065	.070	.025
Info. Sys.	.004	.040	(.005)	(.030)	(.050)
BETA	1.20	1.20	1.15	1.15	1.10

OPERATING MARGIN FIVE YEAR MEANS PER SEGMENT

(CCC - Commercial Segments, GGG - Government Segments)
(NNN - Neutral Segments, () - Signifies Negative Number)

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 OP MARG
       |
   .15 |- - - - - - - - - - - - - - - - - - - - -
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       |
       |
       |
   .10 |- - - - - - - - - - - - - - - - - - - - -
       |
       |    GGG
       |    GGG
       |    GGG              GGG
   .05 |- - -GGG - - - - - - - GGG- - - - - - - -
       |    GGG      CCC      GGG
       |    GGG      CCC      GGG
       |    GGG      CCC      GGG
       |    GGG      CCC      GGG      (CCC)
      ------------------------------------------
            COMB.    TRANS.   SPAC     INFO.
            AIRC.    AIRC.    SYS.     SYS.
```

NORTHROP CORPORATION

1. Northrop Corporation produces F-5, F-20, F-18 and structural components for the Boeing 747. Major research and designs include the Advanced Tecnnology Bomber, telephone and broadcasting stations and sophisticated avionics for aircraft and missiles.

2. Sales to the government have averaged 44 percent of total revenues for the period 1980-1984.

3. Corporate segments include: Aircraft, Electronics, Services, and Construction.

OPERATING MARGINS

() - Signifies Negative Number

SEGMENTS	1980	1981	1982	1983	1984
Aircraft.	.023	(.030)	(.080)	.040	.080
Electronics.	.110	.160	.100	.120	.116
Services.	.183	.190	.110	.149	.149
Construction.	.170	.040	(.010)	(.016)	
BETA	1.40	1.30	1.30	1.15	1.10

OPERATING MARGIN FIVE YEAR MEANS PER SEGMENT

(CCC - Commercial Segments, GGG - Government Segments)
(NNN - Neutral Segments, () - Signifies Negative Number)

```
 OP MARG
      |
   .15|- - - - - - - - - - - -GGG- - - - - - - -
      |                       GGG
      |                       GGG
      |              GGG      GGG
      |              GGG      GGG
   .10|- - - - - - - GGG - - -GGG- - - - - - - -
      |              GGG      GGG
      |              GGG      GGG
      |              GGG      GGG
      |              GGG      GGG
   .05|- - - - - - - GGG - - -GGG  - - - - - - -
      |              GGG      GGG      CCC
      |              GGG      GGG      CCC
      |              GGG      GGG      CCC
      |     NNN      GGG      GGG      CCC
      ________________________________________
            AIRC.    ELEC.    SERV.    CONST.
```

ROCKWELL INTERNATIONAL CORPORATION

1. Rockwell International Corp. produces components for trucks, automobiles, off-highway vehicles, the Space Shuttle and its main engines, navigation satellites, missiles, B-1 bomber, electronic systems, avionics, telecommunications equipment, and microelectronic systems.

2. Sales to the government have averaged 37 percent of total revenues for the period 1980-1984.

3. Corporate segments include: Aerospace, Electronics, Automotive, and General Industry.

OPERATING MARGINS
() - Signifies Negative Number

SEGMENTS	1980	1981	1982	1983	1984
Aerospace.	.050	.089	.080	.090	.090
Electronics.	.090	.062	.090	.089	.090
Automotive.	.050	.010	.036	.036	.120
Gen. Indus.	.100	.145	.096	.088	.106
BETA	.90	1.00	1.05	1.15	1.20

OPERATING MARGIN FIVE YEAR MEANS PER SEGMENT
(CCC - Commercial Segments, GGG - Government Segments)
(NNN - Neutral Segments, () - Signifies Negative Number)

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   OP MARG
       |
  .15  |- - - - - - - - - - - - - - - - - - - - -
       |
       |
       |
       |                                    CCC
  .10  |- - - - - - - - - - - - - - - - -   CCC - - -
       |                                    CCC
       |     GGG        NNN                 CCC
       |     GGG        NNN                 CCC
       |     GGG        NNN                 CCC
  .05  |- - -GGG- - -   NNN - - -CCC- - -   CCC - - -
       |     GGG        NNN      CCC        CCC
       |     GGG        NNN      CCC        CCC
       |     GGG        NNN      CCC        CCC
       |     GGG        NNN      CCC        CCC
    ---------------------------------------------
             AERO.      ELEC.    AUTO.      GEN. I.
```

SANDERS ASSOCIATES INCORPORATED

1. Sanders Associates develops, manufactures, and sells advanced technology electronic systems used in electronic warfare, oceanograpny, electro-optics, antisubmarine devices, long range communications, and precision products. In addition Sanders makes digital plotters, digitizers, graphic displays and other computer-aided design equipment.

2. Sales to the government have averaged 56 percent of total revenues for the period 1980-1984.

3. Corporate segments include: Government Systems and Products and Graphic Systems and Products.

OPERATING MARGINS

() - Signifies Negative Number

SEGMENTS	1980	1981	1982	1983	1984
Gov. S.& P.	.098	.087	.105	.091	.091
Gra. S.& P.	.108	.135	.082	.075	.099
BETA	1.55	1.50	1.30	1.25	1.20

OPERATING MARGIN FIVE YEAR MEANS PER SEGMENT

(CCC - Commercial Segments, GGG - Government Segments)
(NNN - Neutral Segments, () - Signifies Negative Number)

```
 OP MARG
     |
 .15 |- - - - - - - - - - - - - - - - - - - - -
     |
     |
     |
     |
 .10 |- - - - - - - - - - - - - - -CCC- - - - - -
     |          GGG             CCC
     |          GGG             CCC
     |          GGG             CCC
     |          GGG             CCC
 .05 |- - - - - GGG - - - - - -CCC- - - - - -
     |          GGG             CCC
     |          GGG             CCC
     |          GGG             CCC
     |          GGG             CCC
     ---------------------------------------
                GOV.            GRAPH.
                S.& P.          S.& P.
```

VI. SUMMARY AND CONCLUSIONS

The overall purpose of this study was to present appropriate comparative data on major DOD contractors and to evaluate their profitability. Two principal research questions and specific objectives were developed to support this purpose. Chapters I and II outlined the study methodology, provided the defense perspective of the 1980's and framed the historical context with a review of DOD profit studies. Chapter III discussed the comparative groups, explained sampling techniques and defined the business population. Chapter IV addressed profitability from the overall or macro level, and Chapter V addressed profitability from a segment or micro level. The empirical findings and the conclusions drawn from the tests and comparisons are included with each of those Chapters. Rather than repeat those assertions derived directly from the data, this final Chapter will briefly summarize the findings and explore areas for follow on research.

On the basis of the profitability measures selected, the period 1980-1984 proved to be very profitable for prime contractors among the 'Top 100'. Those with sales to DOD that comprised greater than 30 percent of total revenues have, as a group, performed better than those with more modest proportions of DOD business. This conclusion is supported both on a macro level and on a micro or segment basis which includes non DOD government sales.

However, to generalize from this conclusion is considered speculative. There are important qualifications on which this study rests, not the least of which is a period of an unprecedented peacetime defense buildup. Because the total DOD business required for a firm to achieve `Top 100' status in 1984 has grown to nearly 141 million dollars, the conclusions do not necessarily apply to the nearly 20,000 other prime defense contractors not included in that group. The volume of annual revenues sets the `Top 100' apart in the field of DOD contracting as well as in the positions they hold in corporate America.

The variation of the DOD contractors' profits by either measure used in this study has been consistently less than a sample of like sized commercial firms. Even on a segment basis within individual firms, the variations in profits of the government oriented segments proved to be much less than those observed in segments with a commercial orientation. On both an aggregate and segment basis, there was little variability in profits and consequently less exposure to risk for the major contractors studied. Thus the traditional relationship based on higher returns entailing greater risks is reversed. The "why" of the high profitability low risk relationship has not been addressed. However, risk and related variables such as government furnished equipment, progress payments and backlogs may be an area of interest to future researchers.

The final research question asked in this study concerns its usefulness and implications. First, like Gaul, there exist three divergent views on DOD contractors: the DOD view, that of the Congress as representatives of the public, and that of corporate America. While these generalizations are somewhat coarse and very broad, and acknowledging that there are actually many more views, the more obvious contrasts remain valid.

The current DOD view is summed up in the latest profitability study, Defense Financial and Investment Review (DFAIR), [Ref. 4: p.IX-2], which states that "markup policies are balanced, are protecting the interests of the taxpayer, and are enabling U.S. industry to achieve an equitable return for their involvement in defense business". Basically, DOD sees the contractors' environment as one of red tape, continual oversight, endless regulation, and significant risk. However, the contractors' profits, in the main, are considered fair.

Conversely, the Congress and the public want to be assured that the defense cost/benefit ratio is in balance. The contractors are expected to provide the DOD (and the entire federal government) with goods and services at a reasonable price. They appear to be less concerned with profits than with cost overruns, fraud, and the pricing policies constantly reviewed in the press.

Corporate America's views are mixed. Though there are strong incentives to jump on the DOD bandwagon, such a strategic move has long term effects that might prove detrimental in a more constrained economic environment. The prime contractors among the 'Top 100' seem to have adopted a "hold" strategy that is fundamentally moderate. Some larger commercial corporations are diversifying into defense while others are merging to expand their shares of the DOD pie. However, previous corporate excursions into commercial enterprise by DOD heavyweights have often resulted in failure. Notable in this category are General Dynamic's Convairs 880 and 990 and Lockheed's Electra and 1011. Thus, to significantly increase or decrease the proportion of DOD business remains a strategic dilemma for many corporations: while the profit prospects of the 1980's are inviting, the future is uncertain.

In an era of constrained resources, both human and financial, and the rising costs of increasingly sophisticated weapons systems, it is imperative to balance the need for a strong defense industrial base with the fiscal realities of the national budget and the national debt. On this point, there seems to be general agreement. In large part, DOD contracting is the key element in this balance.

In summary, the profitability of DOD contractors should be reviewed more frequently and policy refinements made on the basis this empirical data. It is hoped that this study will represent a useful reference for continued work in this important area.

APPENDIX A
1980 SELECTED CORPORATE FINANCIAL DATA

COMPANY NYSE SYM	TOTAL SALES	DOD SALES	NET INCOME	NET WORTH	0=COMM 1=GOVT
ALD	5518.	322.40	283.90	1340.8	0.
ARC	4156.	285.60	1651.40	7433.6	0.
AV	2150.	286.60	118.50	833.0	0.
BA	9427.	2385.40	600.50	2314.8	1.
CHV	41553.	474.90	2401.00	11077.0	0.
CGP	5120.	250.40	100.50	586.0	0.
CDA	2790.	139.40	150.60	1454.7	0.
ESY	442.	157.60	12.80	140.2	0.
EMR	3067.	190.20	237.70	1229.7	0.
XON	108449.	479.60	5650.10	25412.6	0.
FMC	3482.	834.60	142.70	1245.9	1.
FEN	906.	559.20	54.50	188.9	0.
F	37036.	305.70	-1543.30	8567.5	0.
GD	4743.	3517.90	195.00	999.4	1.
GE	24960.	2202.00	1514.00	8200.0	0.
GM	57729.	508.80	-762.50	17314.6	0.
GT	8444.	264.10	206.70	2302.5	0.
GLD	2200.	244.10	72.50	803.0	0.
GQ	1749.	1322.00	30.70	256.3	1.
HRS	1301.	163.00	79.70	453.0	0.
HPC	2485.	220.30	114.00	1009.7	0.
HON	4925.	687.00	293.50	1904.2	0.
ITT	18530.	335.10	894.30	6273.5	0.
IBM	26213.	496.90	3562.00	16453.0	0.
LIT	4246.	652.30	290.30	1166.8	1.
LK	5396.	2037.00	27.60	306.2	1.
ML	2619.	808.60	138.10	1103.1	1.
MD	6066.	3246.50	144.60	1512.5	1.
MOB	62823.	276.20	2813.00	13069.0	0.
MTI	847.	103.20	47.70	266.4	0.
MOT	2099.	199.20	186.10	1151.9	0.
NOC	1655.	1227.30	36.10	482.4	1.
PC	2014.	158.30	93.60	1081.2	0.
RCA	8011.	538.90	315.30	1362.2	0.
RTN	5002.	1745.00	282.30	1303.5	1.
RJR	10354.	202.00	670.40	3449.2	0.
ROK	6906.	969.20	280.20	1740.2	1.
RD	47353.	225.00	3173.00	18621.0	0.
SAA	281.	102.20	18.50	130.5	1.
SGN	4235.	162.90	167.70	1312.6	0.
SMF	2737.	435.40	38.10	427.4	0.
SY	5430.	844.90	313.00	2033.7	0.
TRW	4984.	508.00	211.90	1287.1	0.
TDY	2926.	396.20	343.80	1401.3	0.
TGT	13226.	1524.40	726.00	4164.0	0.
TXT	3377.	578.70	169.40	1153.8	0.
TOD	610.	394.20	18.50	58.7	0.
UTX	12324.	3108.90	393.40	2758.0	1.
WX	8514.	932.00	402.90	2529.9	0.

APPENDIX B
1981 SELECTED CORPORATE FINANCIAL DATA

COMPANY NYSE SYM	TOTAL SALES	DOD SALES	NET INCOME	NET WORTH	0=COMM 1=GOVT
ALD	6407.	458.20	348.00	1900.0	0.
ARC	28208.	547.30	1671.30	8655.2	0.
AV	2326.	492.70	71.30	1025.3	0.
BA	9788.	2682.70	473.00	2655.2	1.
CHV	45200.	971.70	2380.00	12703.0	0.
CGP	5925.	616.40	-20.40	477.0	0.
CDA	3101.	161.30	170.60	1577.6	0.
ESY	572.	275.00	23.80	159.3	0.
EMR	3429.	237.00	273.30	1386.3	0.
XON	114989.	1152.20	5565.00	28516.9	0.
FMC	3367.	1052.40	176.50	1297.8	1.
FEN	1339.	457.60	64.30	227.3	0.
F	38247.	543.60	-1060.10	7362.2	0.
GD	5063.	3402.40	124.10	1071.5	1.
GE	27240.	3018.00	1652.00	9123.0	0.
GM	62791.	621.60	333.40	17721.1	0.
GT	9153.	341.60	243.90	2375.4	0.
GLD	1846.	151.40	86.40	309.6	0.
GQ	1949.	1710.30	20.50	271.7	1.
HRS	1551.	263.70	104.00	555.9	0.
HPC	2718.	281.10	136.50	1051.3	0.
HON	5351.	838.20	259.30	2093.0	0.
ITT	17306.	379.90	694.60	6116.2	0.
IBM	29070.	804.50	3308.00	18161.0	0.
LIT	4943.	1384.90	311.60	1422.5	1.
LK	5200.	2656.40	-2.00	105.2	1.
ML	3294.	1286.90	200.10	1199.9	1.
MD	7385.	4409.40	176.60	1653.5	1.
MOB	68500.	335.60	2434.00	14657.0	0.
MTI	9576.	177.30	53.00	251.6	0.
MOT	3336.	199.10	175.00	1283.0	0.
NOC	1991.	623.00	47.80	507.0	1.
PC	3349.	198.90	163.70	1309.3	0.
RCA	8005.	876.80	54.00	1637.9	0.
RTN	5636.	1825.90	324.00	1536.0	1.
RJR	11692.	379.60	767.80	3929.5	0.
ROK	7040.	1125.90	291.80	1939.7	1.
RD	47638.	227.70	2122.00	14542.0	0.
SAA	364.	190.40	21.90	150.9	1.
SGN	5343.	238.30	214.00	1658.2	0.
SMF	2834.	564.50	38.40	445.3	0.
SY	5571.	928.10	221.80	2336.6	0.
TRW	5295.	516.50	228.80	1417.6	0.
TDY	3238.	498.50	412.30	1706.5	0.
TGT	13462.	1151.30	813.00	5045.0	0.
TXT	3328.	478.90	145.80	1227.0	0.
TOD	716.	472.10	31.70	80.2	0.
UTX	13677.	3775.50	457.70	3212.5	1.
WX	9367.	1124.70	438.00	2320.7	0.

APPENDIX C
1982 SELECTED CORPORATE FINANCIAL DATA

COMPANY NYSE SYM	TOTAL SALES	DOD SALES	NET INCOME	NET WORTH	0=COMM 1=GOVT
ALD	6167.	591.70	272.00	3207.0	0.
ARC	26991.	268.70	1676.10	9868.3	0.
AV	2459.	667.90	82.01	1128.5	0.
BA	9035.	323.80	292.00	2313.0	1.
CHV	35943.	603.90	1377.00	13246.0	0.
CGP	5817.	182.50	65.60	523.6	0.
CDA	4292.	175.60	155.10	1725.0	0.
ESY	754.	214.70	35.80	90.3	0.
EMR	3502.	182.40	300.10	1558.7	0.
XON	103558.	840.50	4185.90	28440.0	0.
FMC	3499.	1370.60	152.40	1344.2	1.
FEN	1104.	179.10	35.30	237.3	0.
F	37067.	896.70	-657.80	6077.5	0.
GD	6154.	5891.10	160.50	1175.0	1.
GE	26500.	3654.10	1817.00	10198.0	0.
GM	60026.	639.50	962.70	18287.1	0.
GT	8689.	423.70	247.60	2457.2	0.
GLD	1640.	277.70	90.50	887.5	0.
GQ	2057.	1900.40	90.30	320.3	1.
HRS	1719.	268.90	75.60	596.7	0.
HPC	2469.	308.90	86.90	1073.9	0.
HON	5490.	1217.20	272.90	2143.4	0.
ITT	15958.	442.50	702.80	6122.6	0.
IBM	34364.	1196.80	4409.00	19960.0	0.
LIT	4942.	1316.30	315.00	1676.3	1.
LK	5613.	3498.50	207.30	418.4	1.
ML	3526.	2008.30	91.60	321.5	1.
MD	7331.	5630.10	214.70	1319.6	1.
MOB	63328.	254.10	1380.00	14742.0	0.
MTI	1588.	201.80	68.40	383.9	0.
MOT	3786.	237.80	169.40	1700.0	0.
NOC	2470.	1598.20	5.40	493.9	1.
PC	3165.	234.80	156.10	1467.7	0.
RCA	3237.	995.90	222.60	2442.9	0.
RTN	5513.	2252.30	318.80	1711.7	1.
RJR	13075.	286.10	890.00	4756.0	0.
ROK	7395.	2690.50	331.60	2097.3	1.
RD	51615.	326.30	2092.80	16197.0	0.
SAA	436.	303.50	26.40	174.9	1.
SGN	4936.	307.20	113.20	1694.5	0.
SMF	2523.	549.10	-11.50	435.5	0.
SY	5076.	1148.90	113.10	2354.4	0.
TRW	5132.	868.70	196.30	1519.4	0.
TDY	2364.	590.20	250.80	2086.4	0.
TGT	14979.	344.60	840.00	5474.0	0.
TXT	2936.	583.70	84.40	1227.3	0.
TOD	788.	404.20	30.20	116.9	0.
UTX	13577.	4208.30	426.90	3431.7	1.
WX	9745.	1491.70	449.30	3175.0	0.

APPENDIX D
1983 SELECTED CORPORATE FINANCIAL DATA

COMPANY NYSE SYM	TOTAL SALES	DOD SALES	NET INCOME	NET WORTH	0=COMM 1=GOVT
ALD	10022.0	778.20	450.00	2747.0	0.
ARC	25937.0	361.80	1547.00	10659.0	0.
AV	2805.0	675.50	102.60	1128.0	0.
BA	11129.0	4422.00	355.00	3036.0	1.
CHV	29182.0	590.80	1590.00	17962.0	0.
CGP	5963.0	263.30	93.70	571.8	0.
CDA	4532.0	273.40	161.70	1825.0	0.
ESY	826.8	309.50	49.90	236.3	0.
EMR	3475.7	273.50	302.90	1869.0	0.
XON	94591.0	874.00	4985.00	29443.0	0.
FMC	3493.0	1235.00	166.80	1443.0	1.
FEN	891.6	259.90	28.40	245.3	0.
F	44455.0	1072.00	1866.90	7545.0	0.
GD	7146.3	6818.30	286.60	1260.0	1.
GE	26800.0	4518.00	2024.00	11270.0	0.
GM	74582.0	893.40	3730.00	20483.0	0.
GT	9735.0	440.60	270.40	3016.0	0.
GLD	1324.8	278.30	79.20	335.0	0.
GQ	2254.8	2297.70	110.70	452.4	1.
HRS	1995.8	446.00	50.30	813.0	0.
HPC	2629.0	308.00	174.20	1286.0	0.
HON	6073.6	1113.90	231.20	2315.7	0.
ITT	14155.4	663.30	674.50	5755.0	0.
IBM	45937.0	1421.00	5485.00	23219.0	0.
LIT	4719.2	2168.90	231.60	1329.6	1.
LK	6490.3	4005.70	262.80	826.2	1.
ML	3899.3	2271.90	141.30	845.3	1.
MD	8111.0	6142.70	274.90	1067.9	1.
MOB	60624.0	295.50	1501.00	13952.0	0.
MTI	1509.2	281.20	78.50	636.3	0.
MOT	4328.0	321.30	244.00	1948.0	0.
NOC	3260.6	846.60	100.70	576.9	1.
PC	2538.9	264.40	19.70	1441.4	0.
RCA	8977.3	1131.00	240.80	1971.6	0.
RTN	5937.0	2728.30	300.10	1887.4	1.
RJR	13533.0	190.60	835.00	5233.0	0.
ROK	8097.9	4545.00	339.10	2367.3	1.
RD	49432.0	335.50	2493.00	17022.4	0.
SAA	578.1	353.70	37.00	281.0	1.
SGN	6074.0	342.30	114.00	2517.0	0.
SMF	2478.4	649.90	16.20	412.5	0.
SY	4914.0	1132.50	200.00	3946.5	0.
TRW	5493.0	1136.30	205.20	1613.9	0.
TDY	2979.0	538.70	304.60	2641.2	0.
TGT	14449.0	3762.00	716.00	5322.0	0.
TXI	2980.0	671.10	83.70	1139.7	0.
TOD	622.3	444.30	21.90	130.7	0.
UTX	14669.3	3867.40	509.20	3783.7	1.
WX	9532.6	1178.30	449.00	3410.3	0.

APPENDIX E
1984 SELECTED CORPORATE FINANCIAL DATA

COMPANY NYSE SYM	TOTAL SALES	DOD SALES	NET INCOME	NET WORTH	0=COMM 1=GOVT
ALD	10734.0	758.30	487.00	3043.0	0.
ARC	24654.0	330.80	1129.00	9740.7	0.
AV	2080.9	872.70	125.50	1187.7	0.
BA	10354.0	4563.80	787.00	3695.0	1.
CHV	29207.0	432.00	1534.00	14763.0	0.
CGP	6260.4	344.00	101.70	577.7	0.
CDA	5026.9	243.10	31.60	1775.6	0.
ESY	819.4	259.10	59.00	285.9	0.
EMR	4178.8	281.80	349.20	1869.2	0.
XON	97276.0	586.50	5525.00	28851.0	0.
FMC	3429.8	1156.70	225.90	955.9	1.
FEN	878.9	163.20	1.40	222.9	0.
F	52366.0	1124.00	2907.00	9837.7	0.
GD	7839.0	5951.50	331.70	1062.1	1.
GE	27950.0	4514.40	2280.00	12573.0	0.
GM	83890.0	1018.60	4517.00	23953.7	0.
GT	10240.8	414.00	411.00	3171.3	0.
GLD	1397.0	293.80	89.30	854.7	0.
GQ	2603.8	2419.00	103.40	543.6	1.
HRS	1995.8	294.00	80.40	813.1	0.
HPC	2571.0	437.80	197.20	1366.9	0.
HON	6073.6	1354.40	334.80	2380.9	0.
ITT	12701.0	1139.60	302.50	5711.5	0.
IBM	45937.0	1571.60	6582.00	26489.0	0.
LIT	4605.7	2440.70	277.40	2010.9	1.
LK	8113.4	4967.40	344.10	1151.9	1.
ML	3920.4	2260.70	176.00	626.0	1.
MD	9662.6	7684.20	325.30	2345.3	1.
MOB	60624.0	195.00	1270.00	13624.0	0.
MTI	2001.5	468.90	109.80	536.3	0.
MOT	5534.0	399.80	337.00	2273.0	0.
NOC	3687.8	882.00	165.90	724.3	1.
PC	2569.1	273.40	170.00	1619.2	0.
RCA	10111.6	1116.10	246.40	2080.3	0.
RTN	5996.0	3093.00	340.10	1979.2	1.
RJR	12974.0	243.30	843.00	4478.0	0.
ROK	9322.1	6219.30	496.50	2516.3	1.
RD	51369.0	269.30	2539.00	17736.1	0.
SAA	746.1	436.60	49.00	317.3	1.
SGN	5920.0	415.70	301.00	2693.0	0.
SMF	2518.8	560.60	50.30	483.7	0.
SY	5687.2	1615.10	235.70	2302.9	0.
TRW	6061.7	982.50	266.80	1756.6	0.
TDY	3494.3	425.80	574.30	1159.3	0.
TGT	14390.0	746.90	631.00	6153.0	0.
TXT	3221.0	805.00	113.50	1137.7	0.
TOD	506.8	141.90	18.90	136.7	0.
UTX	16331.8	3236.80	645.00	4169.4	1.
WX	10264.5	1943.50	535.90	3740.3	0.

APPENDIX F
1980-1984 SEGMENT OPERATING MARGINS DATA

COMPANY NYSE SYM	SEGMENT	0=COMM 1=GOVT 2=NEUT	OPERATING MARGINS 80	81	82	83	84
BA	COM TRANS	0	.09	.04	.003	.014	.003
	MIL TRANS	1	.084	.132	.113	.110	.111
	MSL/SPACE	1	.05	.053	.102	.09	.095
FMC	IND CHEM	0	.135	.143	.154	.168	.132
	PET EQUIP	0	.173	.203	.16	-.033	-.093
	DEF EQUIP	1	.126	.092	.082	.099	.135
	PERF CHEM	0	.034	.125	.030	.061	.105
	SPEC MACH	0	.017	-.005	-.057	-.026	.063
GD	GOV AEROSP	1	.069	.082	.095	.100	.103
	GOV SHIPB	1	.025	.010	.026	.060	.094
	COM SHIPB	0	.004	-.310	-.380	-.006	.147
	LAND SYS	1			.032	.032	.038
	OTHER	0	.086	.015	.008	.020	.023
GQ	AEROSPACE	1	.080	.104	.090	.030	.070
	I/F SERV	0	.050	.012	.160	.160	.130
	COMM PROD	0	.025	-.050	-.080	-.020	-.030
LIT	ADV E. SYS	2	.104	.084	.106	.101	.103
	BUS SYS	0	.053	.042	-.001		
	E & E SYS	0	.098	.101	.093	.086	.087
	IND S & S	0	.180	.170	.162	.090	.035
	MAR E&P	1	.161	.113	.093	.111	.104
LK	M, S&E SYS	1	.059	.065	.060	.063	.065
	AERO SYS	2	.091	.108	.104	.138	.099
	M & I SYS	1	.125	.117	.089	.111	.053
ML	AERO SYS	1	.073	.071	.076	.083	.078
	BASIC PRO	0	.136	.104	-.050	.082	.200
	DATA SYS	0		.051	.051	.057	.052
MD	COMBAT AIR	1	.070	.070	.080	.030	.090
	TRANS AIR	0	.060	.030	.040	.030	.026
	SPACE SYS	1	.060	.065	.065	.070	.025
	INFO SYS	0	.004	.040	-.005	-.030	-.050
NOC	AIRCRAFT	2	.023	-.030	-.080	.040	.080
	ELECTRONICS	1	.110	.160	.100	.120	.116
	SERVICES	1	.183	.190	.110	.149	.149
	CONSTRUCTION	0	.170	.040	-.010	-.016	
ROK	AEROSPACE	1	.050	.089	.080	.090	.090
	ELECTRONICS	2	.090	.062	.090	.089	.090
	AUTOMOTIVE	0	.050	.010	.036	.036	.120
	GEN INDUS	0	.100	.145	.096	.086	.106
SAA	GOVT S & P	1	.098	.087	.105	.091	.091
	GRA S & P	0	.108	.135	.082	.075	.099

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